B R Sharma

FORENSIC SCIENCE *in* Criminal Investigation & Trials

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B R Sharma

FORENSIC SCIENCE *in* Criminal Investigation & Trials

SIXTH EDITION

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PREFACE TO SIXTH EDITION

Forensic Science in Criminal Investigation and Trials is an encyclopedic comprehensive guide, a practical multi-professional treatise, written in non-technical language. The sixth edition of this book is updated with recent changes in the area of forensic sciences. This edition covers new emerging fields and updates the content of the older ones.

As Forensic Science is highly diversified, there is no book which encompasses the entire field and that too in layman's language, especially from an experienced scientist. There is no book on Forensic Science which fits the bill and assists the non-specialist to acquire a working knowledge in Forensic Science to meet the challenges of scientific evidence. Books for the specialist are available in plenty. But there is none for the judge or the lawyer, nor for the investigator or for the public. These rapid changes have, therefore created a need for extensive revision of the book, which has been done.

The progress in science and technology, especially in the handling, processing, transfer of information and evaluation tools and techniques has been phenomenal in recent years. Though the subject is highly scientific and technical in nature, it has been tackled in such a way that any lay person cannot only follow it but can also enjoy it. The author, therefore, has ventured to produce scientific book(s) in non-scientific language.

It is true that the book often contains hard and dry facts, but numerous photographs, illustrations and case histories are interspersed in the text to make the subject somewhat lighter, more lucid and easily intelligible. It combines and presents the content relating to diagnostic skills of a physician, the dexterity in approach of a surgeon, the research skill of a forensic expert, and above all, the teaching skills of a professor to bring home a wide range of subjects relating to the concerned field of law. Case law is the lifeline of the court decisions. The Supreme Court's decisions (cases of 21st century given separately) have been included in this edition along with the summary. These decisions provide guidelines on various points of law and facts on scientific evidence which helps in understanding the concept in a better way.

The book is addressed to all those who are concerned with, and deal with forensic cases, administrators, investigators, experts, counsels, judges, forensic science students and even the public who face the crime abuse from time to time.

B.R. SHARMA

PREFACE TO FIFTH EDITION

The revision of this book has been long overdue. Numerous reprints, with or without supplements have been published since its last revision in 2003, but it had started looking outdated. Hence the present revised Avatar. The changes in all aspects of forensics have been so wide and expansive that the new additions (chapters in the present Edition increased from 21to 33!) in the new edition have made it almost a new book. It covers most (not all) of the new emerging fields and updates the contents of the older ones. Only those specialties have been left, for the next Edition, which are not being utilized extensively in this country currently. The progress in science and technology, especially in the handling, processing, transfer of information and evaluation tools and techniques has been phenomenal in recent years. Even a decade old devices, ideas and literature have become redundant in most of the spheres of activities including that of Forensic Science.

Major thrusts in Forensic Science, in recent years, have been in the following fields:

1. Computers, computer crimes, cyber crimes.
2. Automation in all aspects of Forensics work, especially in its tools and techniques.
3. DNA analysis has become the be all and the end of all personal and other identifications.
4. Cell Phone has become the tool of choice for committing crime and also the weapon of great unparalleled utility to know the contacts of the culprit and his movements during the commission of crime. In addition it provides a host of other useful information.
5. Video-conferencing has eliminated the need for personal court attendance of the Forensics experts.
6. Voice analysis is becoming indispensable in scams, kidnapping and a multitude of other crimes.
7. Lie Detection, Narco-analysis and Brain printing are revolutionizing the interrogation. They are eliminating the repugnant third degree methods.

And so on.....The list is inexhaustible.

As Forensic Science is highly diversified there is no book which encompasses the entire field and that also in layman's language especially from horses' mouth. There is no book on Forensic Science which foot the bill and assist the non-specialist to acquire working knowledge in Forensic Science to meet the challenges of scientific evidence! Books for the specialist are available in plenty. But there is none for the judge or the lawyer, nor for the investigator or for the public. The rapid changes have, therefore created a need for extensive revision of the book, which has been done. Though the material is technical in nature yet it has been tackled in such a way that any intelligent person, given the will, can not only follow it but can also enjoy it.

The users targeted for the book is the judge, the lawyer, the investigator, the students of Forensic Science and the public at large. All of them are, largely, non-technical. The author, therefore, has ventured to produce scientific book(s) in non-scientific language. Yet it includes all the information, which a non-technical user would need in the dissemination of justice and in understanding the subject.

The steep rise in the crimes: Frequent murders, brutal rapes, mind boggling scams: the Commonwealth Game Scam, the 2G Telecommunication Scam, the Adarsh Buildings Scam, the Army Land Grab Scam and the coming up staggering illegal Foreign Deposit Scams are just the trailers of the pictures of Crime which the crime syndicate are churning out day in and day out. They need the latest tools and techniques. The book proposes to give basic knowledge of all about it.

Case Law is the lifeline of the court decisions. The counsels often quote only those cases, which favour their versions up-to-date case laws, mostly Supreme Court decisions (Supreme Court Cases of 21st century given separately), have been given. They provide guidelines on various points of law and facts on scientific evidence.

Many a lawyer feels at his wits' end when he has to present the expert and his evidence, Worse still, when he is to determine his (expert's) bona fides or standing; the worst of all, when he has to dissect the expert's evidence to find lacunae and falsehoods in the evidence. The book takes care of all these hurdles and describes the modus operand! for their handling correctly and comprehensively.

It is true that the book often contains the hard and dry facts but numerous photographs, illustrations and case histories are interspersed in the text to make the subject somewhat lighter, more lucid and easily intelligible.

This book, I must admit, is a result of both research and spade work. But it is not written from an ivory tower. It is based mainly on decades of personal practical experience in processing clues at the scene, evaluating them in the laboratory, presenting the findings in the court and meeting the challenges of numerous prominent and heady lawyers and opposing experts while giving evidence in courts. Besides, I have no hesitation to state that I have utilized the experience of all those who were and are involved in Forensic Science and whose experience is available in books, journals, brochures, departmental manuals and circulars, in seminars and conferences and on Internet. The information so gathered has been hashed and thrashed with concerned specialists individually and severally in seminars and meetings, in classrooms and lecture halls, Thus, it bears the hammering and honing of hundreds of Forensics experts, of police investigators, of legal luminaries and of students of Forensic Science.

The book is an encyclopedic comprehensive guide, a practical multi- professional treatise, written in non-technical language, addressed to all those who are concerned with and deal with Forensic cases: administrators, Investigators, Experts, Counsels, Judges, Forensic Science students and even the public who face the crime abuse from time to time.

The book should be free of errors, has been my cherished endeavour. However, acts of omission and commission are bound to be there; my apologies for the deficiencies, I shall be obliged if I am made aware of them.

Suggestions for improvements will be thankfully received and personally acknowledged.

B.R. SHARMA

ACKNOWLEDGEMENT TO THE FIFTH EDITION

I gratefully acknowledge the advice, wguidance, help and blessings of all those numerous well-wishers who have made it possible to write this book on Handwriting Forensics. But for their visible or invisible contributions it would not have been possible to induct in so much latest, relevant and essential information on the subject to make this new Avatar in the field of Forensic Science unique and indispensable to all those who are concerned with Forensics.

I am particularly thankful to all those Forensic Experts, researchers and thinkers, past and present, who, by dint of their hard work had made Forensics indispensable in dissemination of real justice and brought a status to the Forensic community. They are too numerous to be individually named here. The list includes also those who are spending their precious time day in and day out to make Forensics acceptable, objective, reliable and convincing through better data base and striving to achieve automation.

My thanks are particularly due to the following:

1. Shri D.R. Sharma, my elder brother, who provided the needed encouragement and inspiration and more importantly his blessings, to carry out this onerous task.
2. Mr. Sudarshan Sharma for providing all sorts of help in the preparation of the manuscript, drawings, photographs, illustrations and charts and providing computer help in giving the final shape to the manuscript. I am particularly indebted to him for weeding out the Printer's Devil (and that of the author's) at the final proof reading stage.
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6. I also thank those persons whose works I have utilized unhesitatingly to make the book more useful to its readers.
7. Most importantly, I thank my Editors. Producers and publishers who have to bear with me for the vagaries of my time scheduling, and for the excellent job they have been doing all along to make this book such an excellent production.

B.R. SHARMA

PREFACE TO THE FOURTH EDITION

The revision of the book to produce the IVth Edition has been in the melting pot for a considerable time. It was a gigantic task and daunting too. The explosive advances in science and technology were the main challenge to update the information and yet not to make it the scientific bug to cause scientific blues. The majority of the readers are non-scientists. They are the police officers, the lawyers, the judges. The general student of Forensic Science who wants to get an overall bird's eye view of this expanding and overspreading science would also not like to be bogged down by the complicated technical details. It has been my endeavour to avoid the same. I hope I have succeeded in the effort and the additions in the new Edition do not cross the Lakshman Rekha.

Tremendous changes in all aspects of scientific investigation of crimes have taken place in the past decade or so and are continuing at a rapid pace. These changing trends have been encapsuled in the new edition. They mainly relate to:

1. Current thinking on Forensic Science.
2. Changing patterns of Firearms and their misuse.
3. New tools and techniques in handling Disputed Documents.
4. Explosives and Explosion.
5. Narcotics and Psychotropic Drugs.
6. Fires, especially arson.
7. Alcohol especially drunken driver.
8. DNA profiling.

The new trends in handling crimes, which are gaining increasing momentum, have been added as new topics. They are:

1. Computers
2. Forensic Psychology
3. Voice Analysis
4. Microtraces

The utilisation of the expertise on the above topics is yet limited in India but we can no longer afford to remain illiterate on these topics. For example, computer has engulfed all aspects of human life. It is making rapid stride towards crimes both for its control and creation. We can ignore the computers only at the societal peril. Likewise Forensic Psychology has to play increasingly important role in handling criminals, especially those criminals who are the first timers or who are the chance criminals or those who are the victims of circumstances.

In addition, it has to play its rightful role in the dissemination of real justice without third degree methods and bringing some solace to the victims. Likewise, voice analysis is becoming indispensable. The existence of Osama Bin Laden has been confirmed only through voice analysis. The analysis would certainly help to identify the ransom criminal and his ilk.

The microtraces, as evidence, will, perhaps, be the most important evidence in the changing scenario of crime, crime scenes and the absence of traditional evidence of eyewitnesses, approvers and the like and the criminal modus operandi. In quite a few cases perhaps it will be the only evidence to tie the criminal with the crime.

The discussions have naturally to be brief in a book of this type. However, I hoped the concise contents do not affect the clarity.

I have no hesitation to admit that the book though mostly based upon personal experience, yet I have utilised all available information in the literature, on the internet or from the personal communications and discussions with colleagues, friends and students.

I have no illusion that I have eliminated all acts of the omission and commission but I do hope that they are few and far in between and they do not affect the authenticity and the utility of the information.

Lastly, I request all serious readers of this book to favour me, as in the past, by pointing out the acts of omission and commission, ambiguities, if any, and suggestions for further improvement of the book. All communications will be thankfully received and personally acknowledged.

B.R. SHARMA

INTRODUCTION TO THE THIRD EDITION

Dr. Sharma's book 'Forensic Science in Criminal Investigation and Trials' has become a classic. It has undergone three Editions and four issues. Thousands of copies of the works have been sold throughout the country and abroad. They form part of the libraries of all the top lawyers, the ace investigating officers and the learned Judges. It has become indispensable to all those who are involved directly or indirectly in the dissemination of justice.

Many persons are surprised to find that Dr. Sharma's 'Forensic Science', as it is popularly known, is the only book on the subject in India. The reason for the same is not far to seek. Forensic Science is a multi-disciplinary science, involving all pure and applied sciences. In addition, it has developed its own branches over the years, such as, Forensic Ballistics, Serology, Dactyloscopy, Document evaluations, etc. It is also a multi-professional science and involves the police officer, the lawyer, the judge and, of course, the Forensic Scientist. It is not everybody's cup of tea to know, to understand and to interpret the tenets of this multi-disciplinary and multi-professional science to the specialist and the non-specialist alike. It is only a person like Dr. Sharma who started his career as director of a single-man's laboratory and progressively handled, expounded, researched in all branches of the science not within the confines of a laboratory walls only but also at the scene, in the court-rooms as well as in the class rooms of Police Training Colleges, Universities and other institutions of higher learning. The vast experience thus gained, for over three decades, has made it possible for him to encapsule the basic knowledge of the entire field in less than 900 pages. It covers all aspects: investigative, scientific, legal, simultaneously, exposing its potentialities and limitations in a lucid and illustrative manner.

Dr. Sharma, now, heads our State Forensic Science Laboratory. This Edition has come up here, with added dimensions. Two more parts, one on elementary 'Forensic Medicine' and the second, on the latest revolutionary development 'DNA Profiling' have increased the utility of the book immensely. I am sure the book will find place on the shelves and study tables of all the seasoned as well as the upcoming lawyers, the judges and the police officers, the Forensic Scientists and other students of Forensic Science.

I am happy to introduce this Magnum Opus to the readers. May the works help in the dissemination of real justice.

November 3, 1989
Holly Lodge,
Shimla-1, H.P.

(VIRBHADRA SINGH)
Chief Minister, H.P.

FOREWORD TO THE THIRD EDITION

Dr. B.R. Sharma's book on Forensic Science is probably the first book of its kind to be published in India though there have been many books on Forensic Science published in Europe and America. Hence Dr. Sharma's book should get wide circulation not only in all institutions dealing with Forensic Science but should be a text-book for all Police Officers and Magistrates and should form a valuable guide for the judiciary and the legal profession.

Dr. Sharma has divided his book in various parts and each part is complete by itself and could form a separate text-book. He has written it not only from his theoretical knowledge of the subject which is adequate but also from his own personal experience of running an important Forensic Science Laboratory of which he is the head. He has quoted many case histories which make the book still more readable and useful.

I have found this book of absorbing interest and I am sure that everyone connected with Forensic Science in any way would find it extremely useful.

Sd/-
(B.N. Mullik)
President, Indian Academy of
Forensic Sciences.

PREFACE TO THE FIRST EDITION

The lack of understanding and critical appraisal of specialists in general, by non-specialists, is all-pervasive. The field of Forensic Science is no exception. Neither the police, nor the lawyer, nor even the judge appreciates fully the advances or the extensive potentialities of the science. However for success, besides laborious laboratory work, it is necessary that the police correctly collects the correct clues, the counsel links the clues with the accused and the judge utilizes the expertise. If they fail to do so, the whole edifice built on science crumbles down. And it does happen in the courts frequently.

The reason for the debacle is not far to seek. The multi-discipline and multi-professional nature of forensic science needs an inter-professional approach. No such approach has been made. There is no book on the subject which provides a meeting ground for the professions involved—where the police officer can understand not only his own work but he also understands the requirements of the scientist, the lawyer and the judge and vice versa. Books have been written on the subject by authors belonging to all involved professions. Some of the books are excellent; but they are useful to the members of the professions of the authors only. They can hardly be read by members of the other professions. The intra-professional barriers have remained uncrossed.

In the present work, a serious attempt has been made to eliminate personal and professional bias and to delineate objectively the fundamentals and the parts and duties of the involved professions in a non-technical language. It is believed that the text can be understood even by a non-science student. It is hoped that the format chosen is sufficient to provide basic understanding of the science to the persons concerned and to enable them to carry out their functions more efficiently.

The various chapters of the book cover one important topic each. They are divided into sub-topics: importance, nature, problems, location, collection, evaluation, legal aspects, presentation, case law and bibliography. Thus the main needs of the various professions are covered in these sub-topics.

A book involving many disciplines and many professions necessarily has its limitations. I seek, on the score, the indulgence of the readers. May I request them to point out the same to me (or to the publishers)? All suggestions for the improvement of the book will be thankfully received and personally acknowledged.

B.R. SHARMA

ACKNOWLEDGEMENT TO THE FIRST EDITION

I am thankful to all who have helped me by way of guidance, advice, furnishing useful material and literature and encouragement, which has made it possible to revise this book extensively to create almost a new book. I am particularly thankful to:

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3. Computer specialists: M/s Anil Sharma, Aditya Sharma, Devika, Vina Sharma and Sudarshan Sharma for setting most of the book on computer, for improving the manuscript, preparing drawings and photographs, charts, illustrations, correcting the manuscript and thus making this revised version of the book possible.
4. Shri R.L. Sharma, R.K. Sharma, Ashok Sharma, Mrs. Anjula Khajuria who provided the necessary input vis-a-vis the legal aspects including the sprawling Case Law, which give the necessary output in the ultimate analysis of the expert evidence.
5. My wife, Smt. Ishri Devi, who has to suffer from my labours.
6. My Publishers who have been very patient with my procrastinations.
7. The editors and producers of my publishers who have taken so much pains to make the book such an excellent production.

B.R. SHARMA

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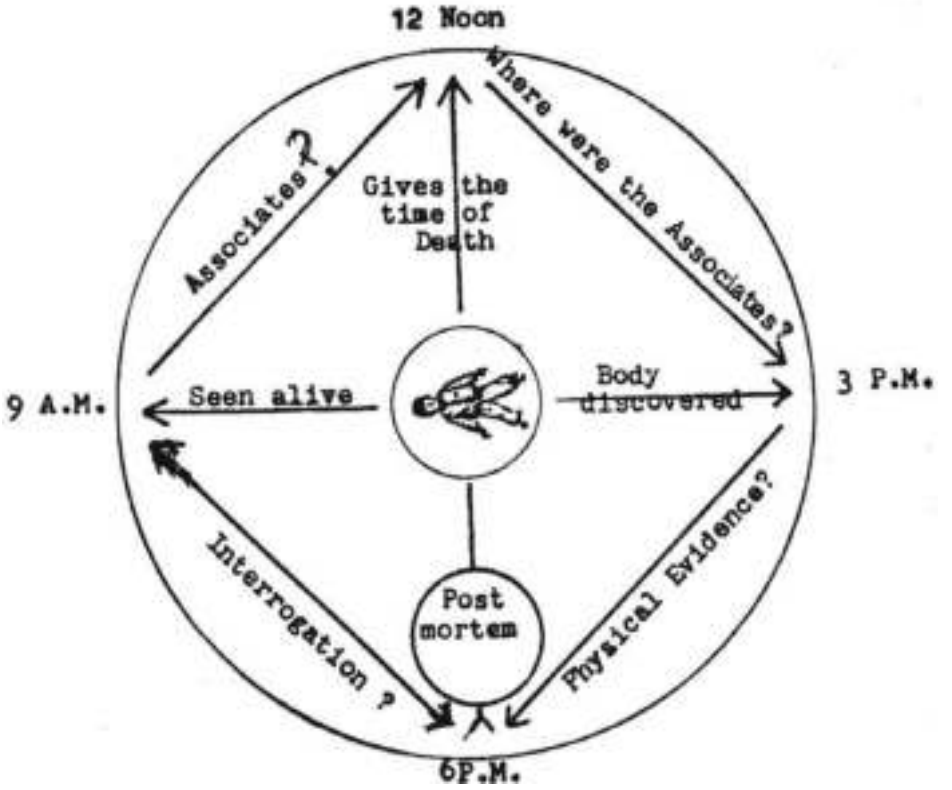


Fig. 1.1
Time element clock

1.1 GENERAL

Forensic Science in criminal investigation and trials is mainly concerned with materials and indirectly through materials with men, places, and time. Among men, the investigating officer is the most important person. In fact, it is his work that determines the success or failure of the application of forensic science in the processing of a criminal case. If he fails to collect the relevant evidences, allows them to be contaminated, mutilated, switched, destroyed, or does not provide correct samples for comparisons, the findings of a forensic scientist will not only be useless; but they will be misleading and even may help the culprit.

Forensic science processes, identifies, and compares the materials. They establish the presence or absence of a link between the crime, the criminal, the victim, the weapon of offence, the place and the time of occurrence *inter se*. The important materials and the processes involved, therefore, form the various chapters of the book. In addition, the place of occurrence (the crime scene) being the most important source of materials has also been discussed.

1.2 NATURE

Forensic science embraces all branches of science and applies them to the purposes of law. Originally, all the techniques were borrowed from various scientific disciplines like chemistry, medicine, surgery, biology, photography, physics, and mathematics. However, in the past few decades it has developed not only its own techniques but also its own branches, which are more or less exclusive domains of forensic science. The science of fingerprints, anthropometry, track marks, documents (especially the examination of handwriting), and forensic ballistics essentially belongs to forensic science alone. In the relatively recent times, significant advances have been made in serology, voice analysis, odour analysis, and in studies relating to pattern recognition, digital photography, automation in processing evidence, and harnessing the computer in the evaluation of the evidence to the extent that it has become an indispensable workhorse of forensics now. The most significant development of the 20th century, in addition to the revolution in information technology, has been DNA profiling for identification of human beings. It has been extended to animals and even to plants.

Two peculiarities characterise Forensic Science:

1. It is multi-professional.
2. It is multidisciplinary.

The forensic scientist has to depend upon the investigating officer, on one hand, for proper functioning of forensic science, and on the presenting counsel and the judge, on the other, for its effective utilisation in the dissemination of justice. If the investigating officer does not know how to collect the correct clues, how to preserve them, how to pack them, and keep intact the integrity and the identity of the clue material, the best of the expertise and the best of instrumentation with the scientists would not help. The investigating officer has to be a specialist in handling the clue correctly. Likewise, the counsel and the judge have to know the science broadly so that they can co-relate the scientific evidence with the rest of the evidence: oral, circumstantial, or of other specialists. Public also has to know the importance of forensic science and the clue materials so that they do not disturb, destroy, or contaminate the clues at the crime scene or elsewhere, and can demand application of forensic science from the authorities if they have failed to do so.

The second peculiarity is that this science is an all-inclusive science and call for comprehensive Forensic Science Laboratories which should have experts in all disciplines, equipment for all branches and comprehensive libraries and other required utilities. It is not possible to do so being too costly to set up the system. Hence, it is not even attempted. The major facilities, which form the bulk of the work referred to the laboratory, are organised. Assistance for the specialities, which are utilised only rarely, is obtained from institutions of higher learning and research, including universities where such facilities are available. The laboratories, in fact, are located at such places where other scientific institutions such as universities, medical institutes, institutes of technology, or other institutes of higher learning, research, and development are available.

1.3 APPLICATIONS

There is an urgent and widespread need for the application of forensic science in the criminal justice system. The present scenario of crime investigation and prosecution of criminals in India is rather dismal. A large percentage of the trials, in heinous crimes, ultimately end in acquittals. The official figure for the acquittal is very high. Unofficial figures are even higher, above 90%. It is estimated that the prosecution agencies spend lakhs of rupees on each trial. Thus, not only the money stands wasted in acquittal cases, but worse still, a dangerous criminal goes scot-free and is let loose in the society. The worst consequence of these frequent acquittals

is that the citizen loses respect for the law. The acquittals embolden the criminals. They escalate crime and burgeon criminals.

The need for the application of science in the dissemination of justice is imperative. Many factors including the following are responsible for the same.

1.3.1 Social Changes

The society is undergoing drastic *social changes* at a rapid pace. India has changed from a colonial subject nation to a democratic republic. Sizeable industrial complex has sprung up. The transport facilities and the means of communications have been revolutionised. A criminal may commit a crime and in two hours he may be an anonymous figure in any metropolitan city.

Satellite communications were used to guide the terrorist group in Mumbai while the mentors were sitting cosily in Karachi and watching the ongoing holocaust.

There is a growing shift from a rural to an urban society. These changes have made the old techniques of criminal investigation obsolete. In British days, the police was so much feared that once it laid hands upon an individual, he would "confess" to any crime, he may not have even known. The fear is vanishing now. However, the use of those "third degree methods" continues even today[1]. Besides, the abuse of the Third-Degree Methods is not only becoming increasingly less effective but it is becoming hazardous to the perpetrator increasingly. It does not find favour with the current generation of the administrators, the judges, and the public at large.

Other legal, effective, efficient, and humane methods must fill the vacuum.

1.3.2 Anonymity

The quick means of transport and the high density of population in cities have facilitated the criminal to escape from immediate arrest (and punishment) after the commission of crime. The criminal can hide himself in a corner of a city or move away to thousands of miles in a few hours after committing a crime at a particular place. Nobody, at the new place, would know or try to know who he is or where he has come from. He, thus, often escapes apprehension and prosecution.

The individual is becoming self-centred. He, especially in cities, does not know even his next-door neighbour. Thus, even if the neighbours are killed, the murders come to light many days later; sometimes only when the bodies putrefy and emit a foul smell. In the meanwhile, the culprit(s) leave the scene and the evidence is also destroyed, obscured, becomes indistinct, or diminished.

> *Anuradha Bali, a lawyer in Punjab and Haryana High Court eloped with an already married person, Deputy Chief Minister of Haryana (who had to resign later), lost her job and later was divorced. She was found dead on 4 August 2012 in a small house in Chandigarh. The stink from her putrefied body revealed her death. (CH)*

1.3.3 Technical Knowledge

The technical knowledge of an average person has increased tremendously over the years. The criminals are using this technical knowledge. The crime techniques are getting refined. The investigating officer, therefore, needs to know and use scientific methods to combat the modern scientific criminal. For example, some years ago, the terrorists in Punjab using night vision appliances killed many police personnel. The security forces could meet the challenges only when they also employed night vision devices to fight them.

1. Between 2001 and 2013, 1275 custodial deaths occurred in India. (NCRB data) National Human Rights Commission (NHRC) recorded 14,231; i.e., 4.33 persons died every day in police and judicial custody in India from 2001 to 2010. This includes 1,504 deaths in police custody and 12,727 deaths in judicial custody.

Fig. 1.2
The race between criminal and state

1.3.4 Wide Field

The field of operation of the criminals is widening at a terrific rate. Formerly, the criminals were usually local, now we find that national or international criminals are a common phenomenon. Smuggling, drug trafficking, money laundering, financial frauds, and forgeries offer fertile and ever-expanding fields.

International terrorism is a developing horrific phenomenon. The IS terrorist of Arabia has gone global. No country can call themselves safe. The terrorists are using gadgetry, which is truly overwhelming to the common investigator.

> *The attack on the World Trade Centre in New York and on Pentagon in Washington, in 2001, destroying property worth billions of dollars and killing thousands of persons, in one go, is really more than an eye-opener to the world about the capabilities of the terrorists. (CH)*

Cybercrimes have gone beyond the earth — in the space, though the perpetrators are earthly beings. They use ultra-high sophistication.

1.3.5 Better Evidence

Forensics evaluate physical evidence, which is objective. If a fingerprint is found at the scene of crime, it can belong to one person only. If this person happens to be the suspect, he must account for its presence at the scene. Likewise, if a bullet is recovered from a dead body, it can be linked to only one firearm. If this firearm happens to be that of the accused, he must account for its involvement in the crime. Such evidence is always verifiable. It is free from human failings other than outright dishonesty.

Fig. 1.3
Eye-witnesses not always reliable

1.3.6 Alternatives

If we do not adopt scientific methods, what are the other alternatives and what is their ultimate utility?

The alternatives to scientific methods that have been in vogue since time immemorial are:

- Eye Witnesses
- Confessions
- Approvers
- Stock Witnesses

1.3.6.1 The eyewitnesses

The eyewitnesses were/are the kingpins in the criminal justice system. They rule the roost even today. Their evidence is likely to continue to be the most depended upon evidence for some time to come. However, the eyewitness' accounts have inherent weaknesses. Observation power, memory, descriptive skill, emotional inputs, bias, conformational syndrome, and subconscious rationalisation of the eyewitnesses affect the evidence tremendously. The actual observational content of the account of the eyewitness becomes highly subjective and hence, the suspect. Besides, emotional involvement, unconscious bias, and influence of others, especially that of the media, make the evidence of the eyewitnesses highly unreliable. Yet we continue to depend upon the evidence, almost religiously. It results in miscarriages of justice, as it actually took place in the famous case of *Adolf Beck*:

> *There was one John Smith. He defrauded women of their petty belongings after gaining their confidence. His technique was to contract an acquaintance with a woman and visit her residence. After some time he would suggest that she should live with him as his mistress, to which the woman would agree. He would collect some petty items (like a ring) and borrow small amounts of money and would disappear. After some time he was caught and convicted for these frauds.*

Fourteen years after his release, the frauds started again. The modus operandi was the same. One Adolf Beck was suspected to be John Smith. He was found to have some significant differences: (i) He had a German accent while John Smith was reported to have normal accent; (ii) He dressed himself shabbily, whereas John Smith was known to dress properly — a necessity for the kind of fraud; and (iii) he wrote clumsily, whereas John Smith was known to have a good handwriting. But twelve women identified him to be John Smith who had defrauded them! Only one woman was positive that he was not the man. The court convicted him for the crimes on the testimony of these eyewitnesses and imprisoned.

The defending counsel for Adolf Beck was convinced of his innocence. He tried his best to get him released but without success.

About two years after his release, the frauds were repeated. Adolf Beck was again in the dock and convicted on the identification of a set of four women!

He was still in the judicial lockup, awaiting imprisonment, when the frauds were again committed. This time the real man, John Smith was apprehended. He admitted to have committed all the sixteen frauds for which Adolf Beck was convicted.

The authorities instituted an inquiry and found their follies in convicting Adolf Beck. He was released and compensated monetarily for wrongful convictions.

The inquiry's made a significant comment:

The evidence as to the eyewitness accounts is highly dangerous and nobody should be convicted on the evidence of the eyewitness accounts only. (CH)

1.3.6.2 Confessions

True **confessions** are rare. Most of the confessions put up before the courts in India are obtained through *Third Degree* methods, which are illegal, unethical, and inhuman. They are retracted frequently. Besides, in the changed social/political scenario, they often recoil.

Fig. 1.4
Dictated confessions

1.3.6.3 Approvers

The **approver** is an approved class of witness. He confesses or accepts his role in the commission of the crime for personal pardon. He, thus, saves his skin, implicates his friends and perhaps relatives also. He is an unethical witness, though he is a legally correct witness. He often

retracts his statement especially if he finds his good going on the other side. His services are a slur on our justice system.

1.3.6.4 Stock Witnesses

The abuse of **stock witnesses,** like Prem Chand Paniwala,[2] is not only shameful but it is also illegal and a degradation of human values. It is indeed a curse on the society. Besides, the utility of the stock witness, who appears time and again, is limited. The court and the counsel become aware of the character and activity of the stock witness. He is exposed. Yet it goes on. Is the creed of the stock witnesses dwindling? It does not seem to.

Fig. 1.5
The above stock witness was the convenient '*witness*' in over 200 cases

1.3.6.5 The Genie against Crime

Forensic Science has progressed tremendously over the past years. It has crossed all physical barriers as far as the analysis of the evidentiary clues are concerned. Even the tiniest clue of a nanogram or less can be analysed. Forensic Science, therefore, in position, is the IO's Genie to provide the help practically in all cases and in all aspects.

The traditional evidential inputs have become inefficient. The result is frequent acquittals of the criminals. They have to give way to better evidence to control the downward slide in the dissemination of justice.

Forensic science is the modern source of furnishing evidence to find "the truth, the whole truth and nothing but the truth". It holds the beaconing light to criminal justice system to provide real evidence for or against a suspect, because:

- Evidence is always available. Locard's Principle of Exchange, ("every contact exchanges traces") holds.
- Forensic Science can link the culprit with the crime, the victim, the scene, the weapon, and other evidence *inter se* decisively in most of the cases through exchanged evidentiary clues. They are unique. The Law of Individuality holds.

2. *Prem Chand v UOI,* AIR 1981 SC 613 : (1981) 1 SCC 639 : 1981Cr L J 5 (SC).

- Evidence is free from human failings: "bias", "emotions", "rationalisation", "memory lapses", "perjury", and others provided, the scientist is honest, trained, experienced, and dedicated.
- Is verifiable. Other honest scientists can confirm the findings.
- Is efficient: time and cost-effective. Automation and computers have conferred wings to the evaluation processes.

In a nutshell, forensic science is the modern avatar which holds the key to the dissemination of real/true justice for the above reasons.

Promotion and use of Forensic science on a much larger scale is the need of the hour to improve the criminal justice system so that it can serve the society effectively.

1.4 FUNCTIONS

Forensic science performs many functions including the following:

1.4.1 Establish *corpus delicti*[3]

Consider the case of the recovery of a dead body. Death could be natural, accidental, suicidal, or homicidal. Forensic science ascertains the nature of death to establish whether the death was homicidal or non-homicidal. Likewise, it determines whether the given incident is a crime/faked incident/accident/Act of God (Nature). It establishes the existence or non-existence of *corpus delicti.*

Fig. 1.6
Establishing corpus delicti

1.4.2 Determines the *Modus Operandi* of a Crime

The examination of the *corpus delicti*, the crime scene, the evidentiary clues, and the circumstances surrounding the occurrence indicate the possible *modus operandi*.

3. Body of crime.

1.4.3 Identifies the Criminal

Forensic science establishes the identity of the culprit through many clues, in many situations, including the following:

1. The culprit's mobile telephone record may point the needle of suspicion towards the suspect.
2. His computer (SMS, E-mails, transactions) may give details relating to the participation/promotion of the crime.
3. He may leave clues like fingerprints, footprints, tyre prints, hair, blood drops, saliva, semen, or other body fluids at the scene, on the victim, on the weapon of offence, on objects at the scene, in the vehicle he used in the commission of crime or on the arrival/departure routes.
4. He may pick up similar clues from the victim, from the scene, and the paraphernalia thereon.
5. He may leave objects and materials at the scene in the crime vehicle on the weapon of offence or with the victim, or picked up from these entities (scene, victim, and vehicle).
6. The time Analysis of whereabouts at the material time may place at the crime scene.
7. The circumstances surrounding the case may connect the suspect with the crime.

1.4.4 Identity of the Victim

Forensic science through the personal clues on the person of the victim (deceased) helps to identify the unknown deceased/mutilated body/skeletal remains. DNA profiling and fingerprints are the most important clues in this respect. However, the clues mentioned under para 1.7 are equally valid for the identification of the victim.

1.4.5 Miscellaneous

The forensic scientist helps criminal justice system in many other ways including the following:

1. The forensic scientist provides leads to the investigators.
2. He discriminates the real crime scene from the fake.
3. He locates hidden clues, identifies correct clues, and helps to collect proper samples clues for comparison.
4. He establishes a sequence of events.
5. He appraises/verifies the prosecution/defence and finds the correct versions.
6. He helps to identify the innocent accused by de-linking him, *via* clues, with the victim or with the scene of crime.
7. He identifies the correct crime weapon.

1.5 DEVELOPMENT

Forensic Science for effective application in criminal investigation demands multi-professional approach:

1. The investigating officer has to know it.
2. The counsels have to understand it.
3. The judges have to comprehend/appraise/utilise (or discard) it.

The investigator is the *prima donna* in the process. He collects the physical evidentiary clues. He has to know:

1. The nature of physical clues, which are to be collected.
2. Where they are located.
3. How they are collected, preserved, packed, dispatched, and maintaining their identity, integrity, authenticity, and chain of custody.
4. What standard samples for comparison purposes are necessary; and where they are available?
5. How much sample is required and how the sampling is done, how it is collected?
6. What he expects from the analysis of the clues, and what are the forensic possibilities of the forensic analysis?
7. How the analysis results fit with the other evidence (eyewitness accounts, circumstantial evidence,)?

In short, the investigator has to be a specialist in utilising forensics in his own right. The investigating officer is, therefore, given a thorough grounding, both in theoretical and practical aspects, in the above elements at the police training institutions where they have courses on scientific aids. However, the syllabi and the teaching standards are far from satisfactory. They should involve forensic specialists on a large scale in teaching. Periodical attachment of investigating officers to the departmental forensic science laboratories can go a long way in inculcating the scientific spirit and methodology. Some police departments have taken up the initiative; others are likely to follow suit.

The other professionals involved, the lawyers and the judges must also know forensics, its potentialities and limitations, so that they can utilise the evidence correctly and fully in the dissemination of justice.

The public should also know the basics; how to preserve the evidence at the scene or with the victim, so that the authenticity and integrity of the evidence remains intact and the evidence can provide an irrefutable linkage between the criminal and the crime.

1.5.1 Academic Courses

Academic courses in forensic science have come up in many Indian Universities and Institutions. Most of them run postgraduate courses. Some of them (Sagar University, MP, Bundhelkhand University Jhansi, and others) also runs a graduate course. Some others have diploma/certificate courses, which are mainly meant for the non-specialist professionals (police, lawyers, and advocates), who use forensics in their profession. Some universities have introduced Forensics as one of the subjects taught in science degree courses.

In fact, there have been a mini-explosion of academic courses in Forensics in India in the past one or two decades. More than 50 universities/institutes have started various courses. However, most of these institutions are poorly staffed and equipped. It will take some time before they come up with respectable standards.

1.5.2 Research

There are few whole-time researchers in forensic science. This is in spite of the fact that the field is yet unexplored. A few research papers, however, do appear in journals. They are mostly by persons engaged in actual laboratory routine. Some interesting facets of a problem may coax the scientist to investigate the problem further. Or, a sheer necessity in the examination of a case may compel him to carry out experiments on an extensive scale. An average laboratory

worker is too busy with the routine to find time for research. Induction of Forensic Science in the Universities augurs well for research. Persons are taking up research for doctoral degrees.

1.5.3 Dissemination

Forensic Science is not confined to the four walls of a Forensic Science Laboratory, and it is not the concern of forensic scientist only. Its ramifications involve all, particularly the public and all constituents of the criminal justice system. All must know to create better law and order conditions. Proper dissemination of forensic science knowledge is, therefore, indisputable. Modern modes of dissemination like multimedia and internet should be utilised.

Common inter-agency forums should be a standard feature. Here, the police officers, the forensic scientists, the lawyers, the judges, and even the laity should get together and discuss topics of common interest. The print media, conferences, seminars, and formation of societies should also contribute to spreading information all around.

1.6 PRINCIPLES

The laws and principles of all the sciences form the bases of forensic science. In addition, it has also developed its own principles.

1.6.1 Law of Individuality

Every object, natural or manmade, has an individuality, which is not duplicated in any other object. It is unique. Neither the nature has duplicated itself nor can man.

This principle, at first sight appears to be contrary to common belief and observations. The grains of sand or common salt, seeds of plants, or twins look exactly alike. Likewise manmade objects: coins of the same denomination in the same mint, currency notes printed with the same printing block one after the other (excluding the serial number), and typewriters of the same make, model, and batch appear to be indistinguishable. Yet the individuality is always there. It is due to small flaws in the materials, in the arrangement of crystals, imperfect stamping, or due to inclusion or exclusion of some extraneous matter.

The individuality has been verified in certain forensic fields. The most extensive work has been carried out in fingerprints. Millions of prints have been checked but no two fingerprints, even from two fingers of the same persons have ever been found identical.

In a series of experiments carried out by the author during the study of superimposition techniques for fingerprints, footprints, footmarks, die marks, and marks obtained from various parts of firearms, it was observed that with the best of efforts exactly alike imprints even from the same finger could not be produced, which could be superimposed perfectly. The fingerprints were taken one after the other, on the same paper, with the same ink, and by the same person; yet a perfect duplication to give a perfect superimposition could not be achieved. Imperfect inking, unequal pressure, slight differences in the texture of the surface of the paper, or interference from extraneous matter always introduce some differences. If the same finger failed to give identical prints, it is difficult to imagine that exact duplication can be achieved with any other object.

The law of individuality is fundamental in forensic science. Anything and everything involved in a crime, has individuality. Thus, the culprit is unique, his *modus operandi* is unique, his weapon of offence is unique, scene of crime is unique, evidentiary clues, leftover or picked up by the culprit, are unique. We only have to identify the uniqueness to link the crime with the criminal.

1.6.2 Principle of Exchange

Whenever two entities come in contact, mutual exchange of traces takes place.

Edmond Locard, who enunciated the principle, has put in beautiful words:

Fig. 1.7
The linkage—"contact leaves traces"

Edmond Locard Explains

Wherever he (offender) steps, whatever he touches, whatever he leaves, even unconsciously, will serve as a silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects. All of these and more, bear mute witness against him. This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It is factual evidence. Physical evidence cannot be wrong, it cannot perjure itself, it cannot be wholly absent. Only human failure to find it, study and understand it, can diminish its value.

This is the principle or law of exchange. The French scientist, Edmond Locard, was the first person to enunciate it. The law of exchange is also known as Locard's principle.

According to the principle, when a criminal and/or his instruments of crime come in contact with the victim or the objects surrounding him, they leave traces. Likewise, the criminal and/or his instruments pick up traces from the same contact. Thus, a mutual exchange of traces takes place between the criminal, the victim and the objects involved in the crime. If these left over/picked up traces are linked to the corresponding original sources (culprit/victim/scene/objects around the victim at the scene), they establish the contact and link the criminal/victim/scene/weapon of offence, *inter se*.

The principle of exchange is vividly demonstrated in hit and run cases. Numerous evidentiary clues are exchanged including paint, glass, vehicle's broken parts, scratches/ impressions/indentations, spilt fuel oil, Mobil oil, lubricants, greases, mud, dust, fibres, hairs, clothe pieces, blood, other body fluids, tracks and trails, scent, foot and footwear marks and tyre marks (skid), and many more clues.

All contacts in crime exchange traces. Chance fingerprints, tool marks, dust, paint, soils and professional dust, body fluids, and fibres are the prominent clues. It is difficult to imagine a crime where the criminal, the victim, the crime scene, or the objects involved, would not exchange traces. Of course, the dimensions/quantities and the forms of the clues vary.

The basic requirement of the principle is the identification of correct sites or objects with which the criminal or his tool actually came in contact. If the investigating officer is able to establish the points of contact, he is likely to reap a rich harvest of physical evidentiary clues.

If a culprit enters the premises through a ventilator, he leaves his footprints in dust on the sill. He also picks up dirt from the place.

If he breaks a window or a door, the jimmy or other instrument used, leaves its marks on the wooden frame. Fragments of paints, wood, and glass also get transferred to the jimmy, to the clothes or person or the culprit.

The clothes of a burglar (including shoes), who opens a safe by an explosive, are covered with insulating material as well as some exploded and some unexploded explosive materials. He carries them with him wherever he goes, until they are dislodged intentionally or otherwise. If he is apprehended in time, the collection and evaluation of the traces can link him with the explosive, explosive device, and the explosion.

The culprit leaves and carries minute traces only, in most of the cases. It is seldom that he dares or neglects to leave or carry gross objects or traces. On a thorough search, the traces connect the crime and the criminal as effectively as the gross objects, perhaps more subtly.

1.6.3 Law of Progressive Change

"Everything changes with the passage of time".

In other words, nothing is permanent immutable or non-variable. The rate of change varies tremendously with different objects and under different situations.

The impact of the law on forensic science is immense.

The criminals undergo progressive changes. If the criminal is not apprehended in time, he becomes unrecognisable except perhaps through his fingerprints, bone fractures, or other characteristics of permanent (comparatively speaking) nature. They are not always available. The best mode for identification, which now forensics provides, is DNA profiling.

The scene of occurrence undergoes rapid changes. The weather, the vegetable growth, and the living beings (especially humans) make extensive changes, in comparatively short time. Longer the delay in examining the scene, greater will be the changes. After some time, the scene may become unrecognisable. For example, the evidentiary clues in a road accident on a busy road will lose all evidence if the same is not protected/collected/ processed immediately.

The objects involved in crime also suffer change. The firearm barrels are "washed" by the hot gases. The process increases the bore diameter. Metal objects rust. The shoes suffer wear and tear. Repeated use of the tool changes the functional surface characteristics. The extent of change depends upon the time, the upkeep, the atmospheric conditions and the extent and frequency of use/misuse of the particular tool. In the course of time, the object may lose all evidential peculiarities for practical identity *vis-a-vis* a particular crime committed earlier.

The principle, therefore, demands prompt action in all aspects of the criminal investigation.

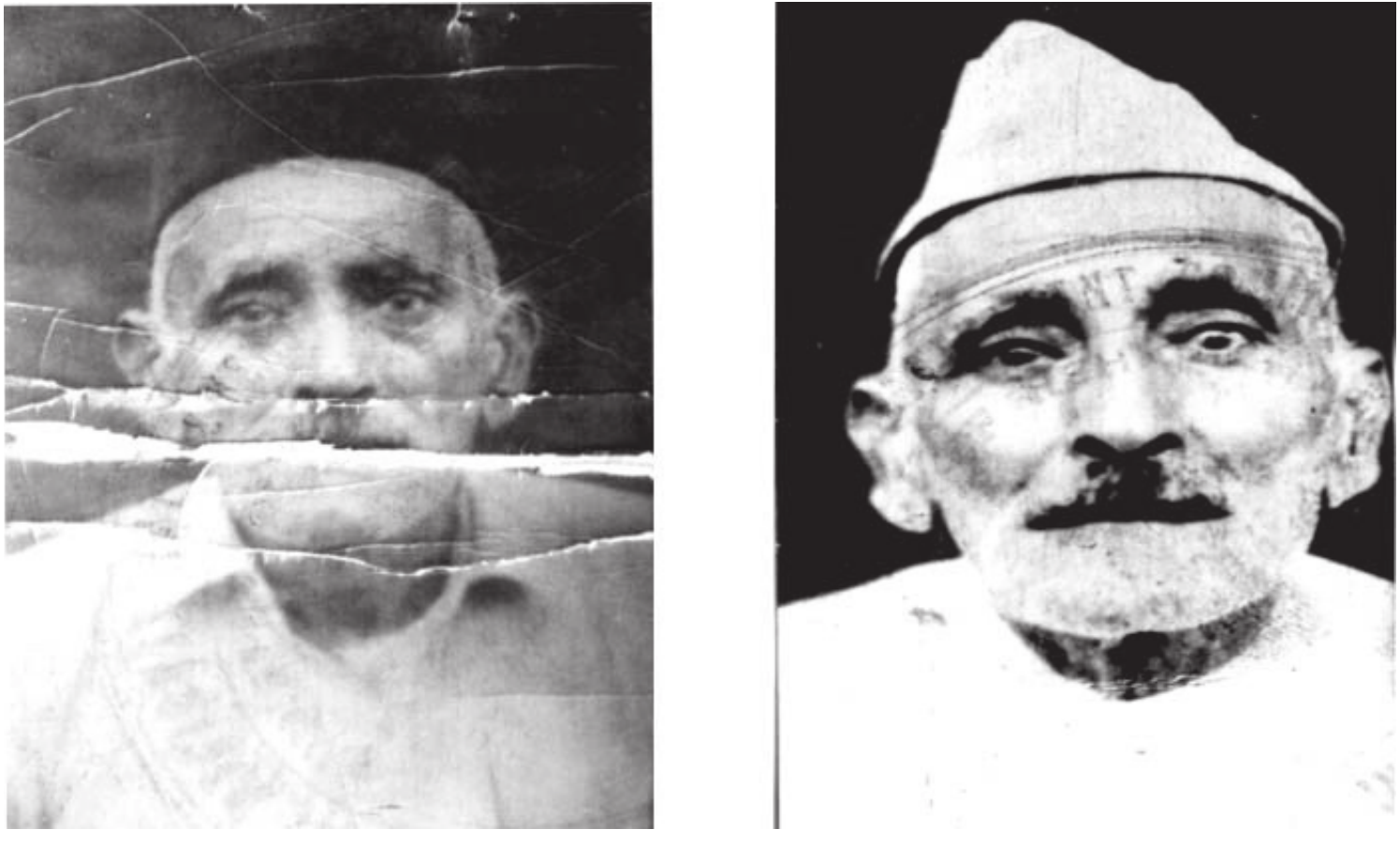


Fig. 1.8
The leader after 25 years. Are the two same? Ears indicate so

1.6.4 Principle of Comparison

"Only the likes can be compared."

It is the principle of comparison. It emphasises that the necessity of providing corresponding samples/specimens/standards for comparison with the questioned items:

In a murder case, a bullet is recovered from the deceased body. The expert opines that the bullet has been fired from a firearm like a service rifle, firing high velocity projectiles. It is futile to send shotguns, pistols, or revolvers as the possible suspect firearms.

A bunch of hair is recovered from the hands of the deceased. The expert opines that the hair belongs to a Negroid person. Hair from persons of white races for comparison will not be of any use.

If the questioned writing is written with a ball pen, it is futile and absurd to send a fountain pen to link the writing with the instrument.

> *Writings, allegedly written on a wall, made available through a photograph, did not give worthwhile results when compared with specimens written normally on a paper. The author requested the investigating officer to provide corresponding specimens written on the same wall, at the same height and with the similar instrument (a nail). It allowed comparison. (CH)*

> *A few years ago, an investigating officer sent moulds bearing footwear impressions lifted from the scene of occurrence along with specimen moulds prepared before a magistrate. The sole patterns were different. An inquiry revealed that the investigating officer had used new pairs of shoes to get the specimens prepared. The investigating officer thought that the culprit could be identified from the pressure patterns from the individual impressions on each mould! (CH)*

1.6.5 Principle of Analysis

"The analysis can be no better than the sample analysed".

Improper sampling and contamination render the efforts of an experienced analyst useless even when he uses the correct tools and techniques. The principle emphasises the necessity of correct sampling and correct packing for useful and worthwhile results.

A criminal while is running away from the scene of occurrence, brushes against a painted surface. Some powdered particles of paint get deposited upon the clothes. The investigating officer scrapes a few grams of paint from the nearby surface with a penknife and sends it as control sample. The result of the analysis shows that the two paints do not match. Why?

A small amount of dust is recovered from a small sticky patch of the shoe of a culprit. The investigating officer collects about 2 kg of soil from the scene, packs it in a tin and sends it as a control sample. The result of comparison is inconclusive. Why?

In a rape case, the investigating officer collects the clothes of the victim. The clothes carry both blood and semen stains. The investigating officer dries the clothes, packs them together and sends them through a railway parcel. He wants to know if the clothes carry semen stains, and if so, to which blood group does the culprit belong? The semen gave AB group. The culprit had A group. The victim had B group.

Why the wrong results?

1.6.6 Law of Probability

All identifications, definite or indefinite are made consciously or unconsciously on the basis of probability.

"Probability" is misunderstood by most. If we say that according to probability a particular fingerprint has come from the given source, the defence counsels plead that it is not a definite opinion. Consequently, it is not customary to talk of "probability" or "probability figure" in courts.

Probability is a mathematical concept:

It determines the chances of occurrence of a particular event in a particular way, out of a number of ways in which the event can take place or fail to take place with equal facility.

If P represents probability, N_s the number of ways in which the event can successfully occur (with equal facility) and N_f the number of ways in which it can fail (with equal facility), the probability of success is given by the formula:

$$P_s = \frac{N_s}{N_s + N_f}$$

If the event consists of two occurrences, which can take place *independently*, the probability of the second occurrence is also given by the same formula. If we denote probabilities of the first and second occurrences by attaching digits 1 and 2 to the relevant letters, the net probability (P_t) is given by the formula:

$$P_t = P_1 \times P_2$$

Likewise, if the event consists of "n" independent occurrences, the net probability of the event is given by:

$$P_t = P_1 \times P_2 \times P_3 \ldots P_n$$

Similarly, if the probability relates to separate events, the net probability is given by:

$$P_t = P_1 + P_2 + P_3 + \ldots P_n$$

A coin is flung. It can rest either head-upward or tail-upward with equal facility. The chances of success therefore are:

$$P_s = \frac{1}{1+1}$$
$$= \frac{1}{2}$$

An unknown woman is found murdered. The corpse has one gold-plated tooth, a tattoo scar on its left hand, and a healed fracture of the collarbone. A woman with these characteristics is reported missing. What is the probability of the corpse being the missing woman? (Given the occurrence of the gold-plated teeth in the area, 1 in 5000, collarbone fractures 1 in 20000, and of tattoo scars 1 in 100).

Here

$$P_1 = \frac{1}{5000} = \frac{2}{(10)^4}$$

$$P_2 = \frac{1}{20000} = \frac{5}{(10)^5}$$

$$P_3 = \frac{1}{100} = \frac{2}{(10)^2}$$

$$P_t = P_1 \times P_2 \times P_3 = \frac{2}{(10)^4} \times \frac{5}{(10)^5} \times \frac{1}{(10)^2}$$

$$= \frac{1}{(10)^{10}}$$

Thus, the chances of the corpse being of another woman are 1 in 10,000,000,000.

We have neglected other factors (sex, age, and dress) and even without these additional factors, the identity of the deceased is established beyond "reasonable doubt".

1.6.7 Likelihood Ratio

Reverend Thomas Bayes, in the 18th century, gave a concept of calculating the chances of occurrence of an event in the form of finding the **Likelihood Ratio** of an occurrence. The idea, in recent decades, is being applied to chances of occurrence relating to Forensic events. The main improvement over the simple probability is that it takes into consideration the prior factors influencing the occurrence of the current incident and the probability of those prior factors is calculated and used in the calculations. The Bayesian probability is then obtained by multiplying the two probabilities.

In the calculation Bayesian probabilities, for both the chances of occurrence and non-occurrence, are calculated. The ratio of the two gives the **Likelihood Ratio**. Thus:

Probability of common source (say)	= 95%
Probability of non-common source	= 5%
then: Likelihood Ratio of common source	= 95/5
	= 19/1; or 19:1
Similarly Likelihood Ratio of non-common source	= 5/95
	= 1/19; or 1:19

Notes:

1. The two probabilities are calculated independently.
2. The Likelihood Ratios are also called **"Odds"**.
3. Knowledge of the prior events and their extent of influence on the current occurrence must be known.

1.6.8 Facts do not Lie

"Facts do not lie, men can and do". It indicates the importance of circumstantial evidence *vis-a-vis* the evidence of the eyewitnesses. The testimony of the eyewitnesses is modified

by auto-suggestion, external influence; suggestions, descriptions, and opinions of others; conscious or unconscious bias and rationalisation. Eyewitness accounts, therefore, is coloured, whereas material evidence is free from these infirmities.

But the material evidence can be manipulated:

1. A person is killed in an accidental firing. The relatives want to implicate their opponents. They procure an unlicensed firearm, fire a cartridge, place the empty firearm at the scene, and plant the firearm on the opponent.

   The police recover the shell and the firearm. The shell is married to the firearm. The police prosecute the person.

2. A person is in the armed forces. He is seen carrying out duty up to 1 a.m. in the unit. He slips through the guarded premises, goes about a 100 miles, commits a murder, returns to his unit, enters into the guarded premises secretly, and he is present on duty at 7.30 am.

   He proves his presence in the unit throughout the night by circumstantial evidence.

3 *A* threatens *B* with death. The next day *B* is found murdered. *B* had no other enemies except *A*. Police suspects *A* as the murderer. He is not found anywhere. He is declared a proclaimed offender. Soon after "A" appears before a magistrate and says he had gone on a pilgrimage, but checking at the allegedly visited places, his visits to the places are not established. He is arrested and prosecuted. In defence, he produces the jail record. He was behind the bars at the relevant time. He escapes the sentence.

1.7 TOOLS AND TECHNIQUES

The tools and techniques of forensic science are oriented to meet the following exacting demands in analysis:

- Sensitivity
- Specificity
- Rapidity

The instruments and technique should be highly sensitive, because the quantities of materials involved are extremely small, often in micro, sub-micro, or microscopic ranges. For example, a few milligrams of certain poisons are sufficient to kill a person. The quantity is distributed in the whole body. Only a few hundred grams of the body matter is provided for analysis. The sample contains quantities of the poison only in micro or nanogram ranges. It must be identified correctly. In comparatively recent times, the quantities involved in some crimes like offences under drug acts have gone infinitesimally small, for example the LSD's dose in micrograms and designer's drugs like Fentanyl, are used in nanogram ranges only.

Paints, soils, dusts, inks, and body fluids clues are sometimes found in sub-micro quantities.

A clue material has to be identified positively in most of the situations. Otherwise, the evidentiary value of the clue is limited. The tools (instruments) and techniques must, therefore, be highly specific. In a poisoning case, it is not sufficient to identify the killer drug as a barbiturate but it is necessary to find out which one it is, so as to trace its source.

The number of cases requiring evaluation of clues is increasing every day. The tools and techniques, therefore, have to be time-effective.

Classical processing of viscera for poisoning involves lengthy procedures of extraction, purification, identification, and estimation. The results are checked and crosschecked for mistakes. Modern techniques may eliminate most of these steps. For example, a poison is extracted from the convenient body part (say blood, urine, lungs, hair, or kidneys). It is identified through chromatography (thin layer, gas/liquid/GS-MS). The quantity is estimated through ultra-violet-spectrophotometry and specific poison is identified through infrared spectrophotometry, FTIR, or mass spectrography. The classical method needs days and weeks for the complete analysis, whereas the above procedure identifies and estimates the clue material in a few hours. Similarly, gas chromatography identifies/estimates blood alcohol in a few minutes. A drop of blood (or less) sample is sufficient.

There are other techniques such as DNA Profiling, Brain fingerprinting, Brain mapping, Narco-Analysis, Polygraph test, Forensic photography, Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS), High-Speed Ballistics Photography, Video Spectral Comparator 2000, Magnetic Fingerprinting, and Automated Fingerprint Identification (AFIS), which play pivotal role in criminal investigations to find out the crime and criminals. Today the investigating authorities are employing these effective techniques in solving the crime problems.

Modern forensic science laboratories, in India, use both classical and modern tools and techniques.

1.7.1 Measurements

Examination of clue materials requires numerous types of measurements. Determination of dimensions (length, breadth, height, depth, curvature, and diameter) angles, melting point (including mixed melting points), boiling points (including boiling point curves and ranges), densities, refractive indices, birefringence, and fluorescence is a daily routine. They require elementary knowledge of science, yet they fix the identity of a material in a number of cases.

Refinement of techniques has improved efficiency and accuracy considerably over time. For example, density gradient tubes have permitted density determination of very small amounts with high accuracy. Likewise, using a hot stage, in Beckline method, small differences in refractive indices can be determined very accurately.

1.7.2 Microscopy

A microscope is one of the most important tools of a forensic science laboratory. It is used in most of the branches (disciplines).

A microscope in its simplest form is a magnifying lens. Continuous improvement and inventions have given a variety of microscopes suitable for different purposes. Compound microscopes, stereomicroscopes, comparison microscopes, fluorescence microscopes, phase contrast microscopes, and metallurgical microscopes are common items in forensic science laboratory.

The use of infrared microscopy (by using an image converter) and scanning electron microscopy (magnification of the order of 20 X to 30,000 X) are comparatively recent innovations. They are being used increasingly in forensics. For example, Scanning Electron Microscope (SEM) is becoming indispensable in Forensic Ballistics (GSR analyses) and Micro-Trace Analysis.

1.7.3 Photography

Photography of old days is vanishing. It's avatar digital imaging in its numerous forms finds extensive use in forensics. It is indispensable in documentation of crime scene, identity record of the criminals, and collection of evidence. It is also used to demonstrate invisible traces, visually unrecognisable clues, stains, and the like. Ultraviolet rays, infrared rays, X-rays, and coloured filters have widened the vision of the forensic scientist. Macro-graphs (magnified photographs), micrographs (photograph of microscopic evidence taken in conjunction with a microscope), microphotography (miniature photography), video-filming have conferred additional handling arms to criminal justice system in general and to the forensic scientist in particular.

The variety of cameras used is very large. The traditional camera has given way to the digital camera, which is changing the scenario of Forensic Photography. Its convenience, quality, cost, and other advantages have more or less pushed out the film photography from the field[4].

Holography is a relatively recent innovation. Here photographs (holograms) are taken with the help of a laser beam. The technique can photograph prints and impressions even on carpets and grass.

1.7.4 Invisible Rays

The use of ultraviolet rays in a criminal investigation is well-known. The use of infrared and X-rays are comparatively later additions and are making their impact increasingly.

Some materials/surfaces absorb ultra-violet rays. The surface fluoresces, thus the invisible entities become visible. The phenomenon is called fluorescence. The absorption power of different materials varies greatly. Even small differences in the surface structures of an item give different fluorescence. The differences help the observer in the identification and differentiation of erasures, stains, sealing waxes, papers, inks, dyes, paints, varnishes, and more importantly forged and genuine currency notes.

Infrared rays have greater wavelength than the visible light. They also have penetration power and pass through some materials. They are useful in the examination of documents, clothes, stains, and the like.

The X-rays have the shortest wavelength of the three types of rays. They have greater penetration power and give fluorescence under suitable conditions (*e.g.*, on a specially coated screen). They are useful in the study of paintings, documents, bullet holes, and fractures, and for locating metal objects in sealed containers (or foreign objects in a body).

1.7.5 Chromatography

Chromatographic techniques have assumed great importance in forensic science. All its forms: Column Chromatography, Thin Layer Chromatography, High Performance Liquid Chromatography, and Gas Chromatography are handy tools. They are used to separate, purify, identify, and estimate clue materials even in sub-microgram quantities. The impurities do not substantially interfere during the analysis.

4. See chapter 'Digital Images'.

1.7.5.1 Column Chromatography

Column chromatography is mainly used to isolate/purify a substance and to separate mixtures. The material is dissolved in a suitable solvent and passed through a suitable stationary phase, packed in a column. The substance is then eluted with one or more solvents. The required material, due to difference in adsorption power, is eluted out of the column in a pure form at different phases, before or after the impurities and other constituents of the mixture, depending upon their solubility and adsorption powers.

Paper chromatography is similar in principle and action. Paper's cellulose fibre and water absorbed by the paper constitute the stationary phase. Two dimensional and reversed phase chromatography are additional innovations in paper chromatography.

Paper chromatography is used for identification, isolation, and purification of the clue materials. For this purpose, the ratio of the distance travelled by the material and the solvent is found, which is characteristic of the substance. It is called the $\mathbf{R}_f$ value of the substance for the system. Circular paper chromatography is handier for the purpose. However, Thin Layer Chromatography (TLC) has almost completely replaced the paper chromatography techniques. The latter gives better separation and less tailing. It is quicker also.

1.7.5.2 Thin Layer Chromatography (TLC)

Thin layer chromatography is very convenient. A thin even layer of the solid stationary (*e.g.*, silica or alumina) is deposited on a glass plate. The clue substance to be identified is processed as in paper chromatography. The results are quicker and more accurate. The stationary phase and the mobile phases can be varied at will. TLC is a method of choice for most of the preliminary investigations, purifications, and identifications of narcotics, drugs, and poisons. It is equally effective for other chemicals in small amounts.

1.7.5.3 Gas Liquid Chromatography (GLC)

Gas chromatography is one of the most important tools in forensic science. The technique is:

1. Highly specific; individualise the entity.
2. Highly sensitive; needs only minute quantities for analysis.
3. Highly fast; gives analysis results within minutes.

The technique is used in the analysis of gases, liquids, vaporisable solids, and for such substances which on heating pyrolyse to give identifiable volatile products. The materials analysed include petroleum products, liquors, perfumes, lacquers, varnishes, paints, barbiturates, soaps and organic insecticides, and many more.

The technique is simple in principle and practice. In general, a liquid or a solid stationary phase supported on small chips or other similar material is packed in the column or some material coated on the inner surface of the column. The column is kept in an oven, maintained at a required temperature; or the temperature is increased progressively to the predetermined final temperature. A variety of the materials are used for the stationary and mobile phase depending upon the nature of the sample being analysed. The length and diameter of columns are also varied for better results. Capillary columns are also used with advantage.

The material to be processed (for purification/identification/estimation or for separation of mixtures) is passed through the column with the help of a carrier gas like Nitrogen,

Helium, Argon, or Hydrogen. The sample in its passage through the column is fractionated. Different constituents come out of the column at different intervals and pass through the detector.

A large variety of detectors, with varying degrees of sensitivities, is available. Some of them are sample specific. They are detected by changes in the current of a circuit fitted therein. A recorder records these changes on a graph paper. Comparison of the graph with similar graphs of known products permits the identification and estimation of the constituents.

If the out-coming gases or vapours are collected in fractions at intervals indicated by the peaks and troughs of the graph, the separation of constituents is obtained.

1.7.5.4 High Performance Liquid Chromatography (HPLC)

The principles on which the HPLC functions are the same as in the case of GLC. The basic difference is that the mobile phase in this case is liquid, a solvent. The solution of the sample is passed through the column under pressure. Adsorption and elution of the constituents take place at different rates (differentially). The separated constituents are detected/collected at the end of the column.

1.7.5.5 GC-MS/LC-MS

In modern analytical techniques, GLC and HPLC combos with Mass Spectrometer have emerged as highly potent analytical tools. The GLC/HPLC separated constituents are subjected to mass spectrometric analysis. Graphic traces obtained give identities/quantities of the constituents.

These instruments are computer-controlled and programmed to give both qualitative and quantitative analyses. The work of the analyst is thus, greatly facilitated. Most of the Forensic Science Laboratories in India use the combos with excellent results.

1.7.6 Electrophoresis

The technique is particularly useful for colloidal or other materials like proteins, inks, paints, and pigments having a residual charge on the molecules. The technique is used extensively in the study of blood and other proteins.

The material to be analysed is taken on a paper strip (or gel). The two ends of the strip are dipped in an appropriate buffer solution. An electric current of appropriate voltage is applied to the strip. The charged molecules move in either direction depending upon their residual charge. The speeds of the molecules vary with the charge and the weight of the molecules and the absorption power of the medium. Thus, different molecules get separated into bands. The position of a band on the strip identifies the molecule.

Electrophoresis is used in DNA profiling. The DNA molecules are fragmented, which are subjected to electrophoresis and the patterns (profiles) of the fragments are obtained. The comparison of the profiles with the standard (known) profiles from the authentic suspected sources are compared to find the common source or otherwise.

1.7.7 Spectrography

Spectrography is the oldest modern technique used in the analysis of clue materials. Its use is limited to elemental analysis of some elements and their compounds.

A flame, an arc, or a spark vaporises a small amount of the materials. The light emitted is passed through a diffraction grating or a glass/quartz prism. They split the light into its various wavelengths. A photograph of split-up light is taken and studied. The position and number of lines depend upon the nature of the substance giving the light. Comparison with standard spectrograms (photographs of the spectrum) gives the nature of the constituents of the sample analysed.

The quantitative estimates are made by studying the densities of the various lines.

1.7.8 Laser Microprobe

A comparatively recent innovation of the spectrographic technique is laser spectrography. A small narrow beam of intense light (laser beam) is used to vaporise the material. The wavelengths of the light so produced are studied in the usual way.

The technique has not been extensively used in forensic work so far. But it has potential as the sample required is small. A small spot from the object is vaporised. There is no noticeable damage to the object. The analysis is "non-destructive" for all practical purposes. The technique is being utilised to "fingerprint" valuable paintings, statues, ancient items of national heritage, and other works of art.

1.7.9 Mass Spectrometry

Mass spectrometry permits identifications of all substances that can be vaporised into charged particles (most of the materials). The samples required for the analysis are virtually in the molecular (or atomic) range.

The technology permits both qualitative and quantitative estimation. The technique has an extensive use in forensic work.

Mass Spectrography, because of its extremely high sensitivity and versatility, has become a technique of choice especially for highly complex materials and substances in minute quantities like designer drugs. It helps to identify an "Unknown" substance through various fragments, which are formed in the process.

1.7.10 Spectrophotometry

One of the most important techniques in forensic work is spectrophotometry. It is sensitive, specific, and rapid. In addition, it is versatile and useful for both qualitative and quantitative analysis. It is simple in principle. The equipment is, however, sophisticated and costly. A beam of electromagnetic rays of selected wavelengths (from ultraviolet, visible, or infrared range) is passed through the material. The material absorbs some of the energy of the rays from particular wavelengths. The residual rays fall upon a photoelectric cell and produce changes in the current of the circuit. The changes are recorded on a graph paper. The comparison of the graphs with those of the known materials permits identification of the unknown material. Quantitative estimation is possible from the peak area.

The technique is extensively used in the identification of sedatives, drugs, poisons, narcotics, and intoxicants. It is also useful in the identification of liquids and gases.

UV, IR, NIR, and FTIR Spectrophotometers form part of the well-equipped laboratories.

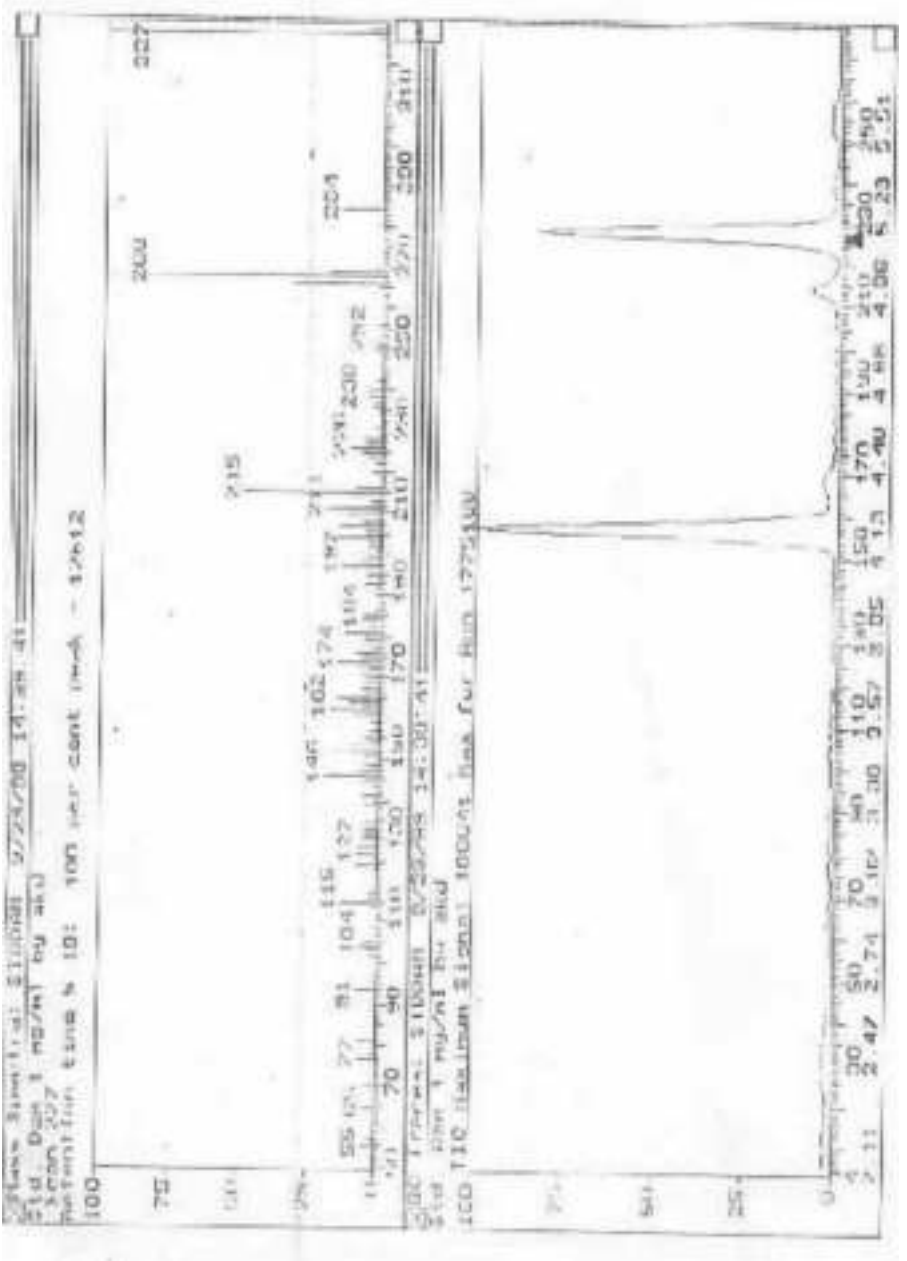


Fig. 1.9
Mass spectrum of heroin

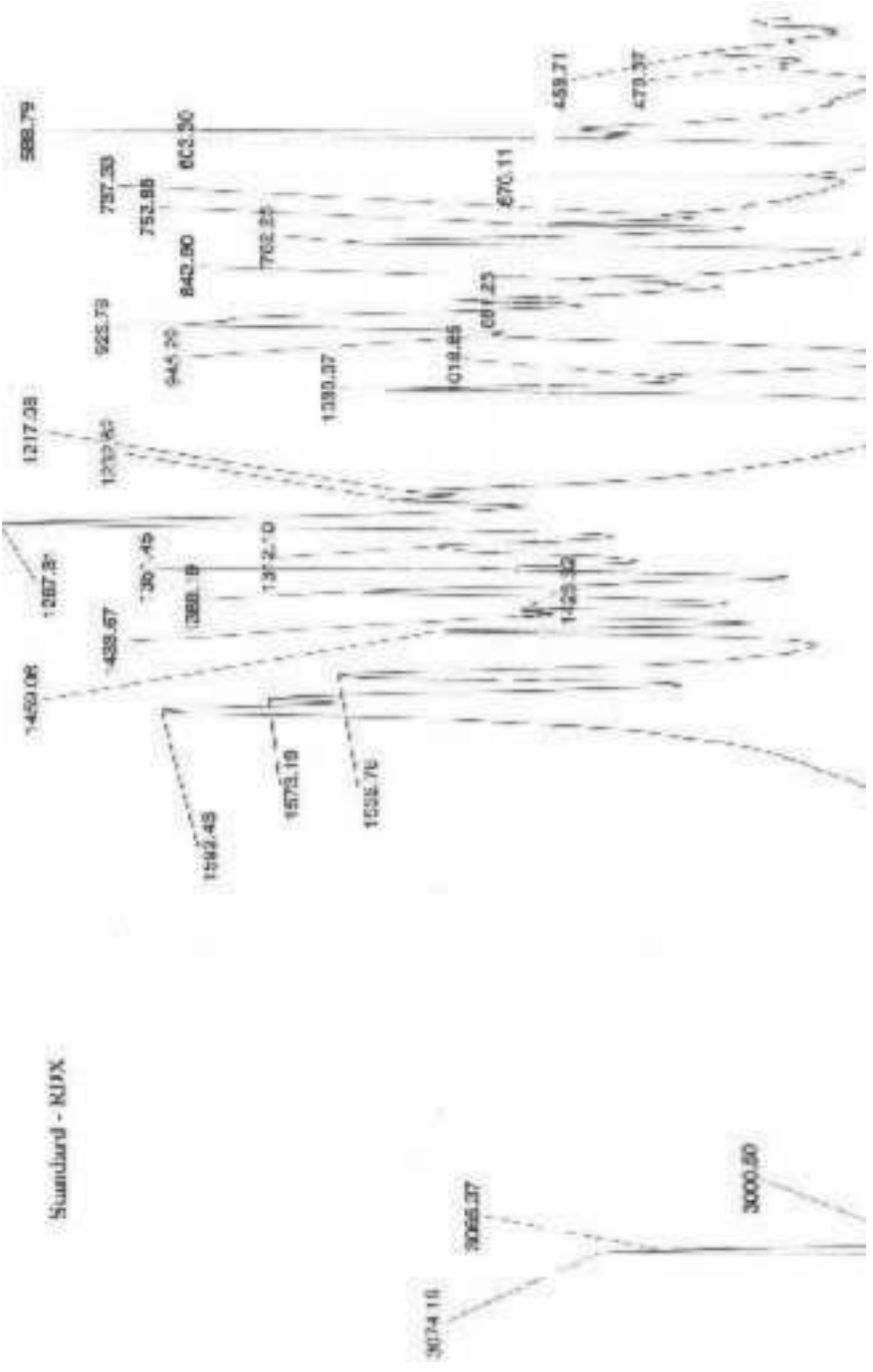


Fig. 1.10
IR spectrum of RDX

1.7.11 Neutron Activation Analysis

Most of the elements can be made radioactive. The radioactivity is characteristic of the element and is studied by spectrometry. The substance is placed in an atomic reactor where it is subjected to high flux neutron bombardment. Neutron sources other than atomic reactors are also known. But they are not so efficient in forensic work.

The technique is one of the most sensitive and specific techniques so far known. It has been utilised in the examination of projectile materials, hair, plant, soils, dust, and other clue materials.

The neutron activation analysis has not become a routine technique nor is it likely to become, it needs high flux neutrons which, in turn, need an atomic reactor. It is a complex and costly gadget.

1.7.12 X-rays Diffraction Analysis

It is a highly sensitive and specific non-destructive technique for the identification of materials. A beam of X-rays is passed through the material. The X-rays are diffracted. The diffraction pattern depends upon the arrangement of the various constituents of the crystal. The patterns of the suspect material are photographed. It is compared with diffraction patterns of known materials to establish identity/non-identity of the substance.

The instrument is usually coupled with a computer, which can store and compare the data so generated and give the identity or common source of the origin of the material.

The technique is useful in the study of barbiturates, glass fragments, minerals, inorganic substances, paints, pigments, corrosion material, dust, and the like.

1.7.13 DTA, NMR, and Polarography

Differential Thermal Analysis (DTA), Nuclear Magnetic Resonance (NMR), and Polarography techniques are important analytical techniques used in chemical analysis. They are being adopted for forensic work. All these techniques are sensitive and specific.

1.7.14 Scanning Electron Microscopy (SEM)

Scanning Electron Microscope is another powerful tool in the hands of forensic scientists. The surfaces is scanned by an electron beam for "observation". Part of the electron beam is absorbed, part is scattered, and part is reflected back.

SEM has the following advantages over optical microscopy:

- SEM gives very high resolution, which highlights even the small differences in surface structure. The resolution approaches the molecular level. Thus, it increases the discrimination power tremendously.
- SEM gives very high magnification (> 30000 X, even more).
- SEM provides images with three-dimensional effect.
- SEM with EDX (an additional gadget) identifies the elemental compositions of the surface or the particles thereon.
- SEM, coupled with computers, has facilitated the evaluation of the GSR (gunshot residues). The instrument provides better evaluations of the surface structures and marks on the fired ammunition.

1.8 FORENSIC SCIENCE INSTITUTIONS

1.8.1 Forensic Science Laboratory

A forensic science laboratory is the main forensic science institution for assisting the Criminal justice system in the dissemination of real justice. It has generally the following scientific departments (divisions):

1. Forensic Chemistry
2. Forensic Physics
3. Forensic Biology
4. Forensic Ballistics
5. Explosives
6. Forensic Toxicology
7. Narcotics
8. Forensic Serology
9. DNA Profiling
10. Forensic Psychology
11. Lie Detector Unit
12. Voice Analysis
13. Photography
14. Instruments
15. Computers/Cybercrimes
16. Scene of Crime

Additional divisions are coming up as per need of the area the laboratory is serving.

Deputy Directors, having a master's degree in their basic specialities, ordinarily head the divisions. They have several years of experience in the expertise and have ample research experience in the specific and related fields. Assistant directors, senior and junior scientific officers, senior and junior scientific assistants, and laboratory assistants and attendants, assist the head of the division.

The non-technical staff carries out clerical work, maintenance of stores and supplies and other non-scientific duties.

The laboratory is guarded against theft and loss of exhibits.

A director who has scientific training and has several years of experience of working in a forensic science laboratory heads the laboratory. In some laboratories, additional/joint directors (technical) and an administrative officer (non-technical) assist the director.

The laboratories, in India, by and large, are well-equipped. They have both the classical and modern equipments. Most of them are using the techniques mentioned above. Sophisticated equipment for techniques like comparison microscopy, spectrography, spectrophotometry, atomic absorption spectrometry, all type of chromatography, electrophoresis, mass spectrography, laser techniques, X-ray diffraction analysis, nuclear magnetic resonance, high performance liquid chromatography, and polarography is increasingly being used in the analysis of the evidentiary clues.

1.8.1.1 Services

The efficiency of a scientist is greatly affected by the services at his disposal. He should have ample working space: search table, chemical benches, lighting arrangement, and regular supply of water, gas, and electricity.

There should be adequate storage space for incoming and outgoing exhibits. They are kept in separate rooms. Each police district is given a separate storage rack so that the exhibits do not get misplaced or intermixed.

The storekeeper for the exhibits handles only sealed packets of the exhibits.

A small workshop greatly adds to the efficiency of the worker, as a slight modification to the equipment and apparatus can be made conveniently in the workshop.

1.8.1.2 Library

It is not possible to subscribe to all the important journals in various scientific disciplines. This deficiency is overcome by locating the laboratory near a university. Here in addition to library and laboratory facilities, consultations with university staff are also possible.

Forensic science literature has been developing during the past few decades. Most of the countries publish one or two journals exclusively dealing with the subject. They should be subscribed for the journals that carry papers on forensic science.

There are not many books on the subject. Therefore, all required books should be available in the library. The bibliography given after the chapters indicate most of the books in the English language. In addition, reference works in chemistry, toxicology, physics, and biology prove useful. They should be purchased.

1.8.1.3 Internet

Modern Internet as source of literature has become indispensable. It may ultimately replace libraries in the usual sense. The literature in digital mode is located at a central place and can be shared through the internet. Most of the literature is now becoming increasingly available internationally through this mode. An E-library of forensic literature at the central level is need of the time. It should be accessible to all the forensic institutions in India.

1.8.1.4 Functions

The main function of a forensic science laboratory is the examination of clue materials involved in crimes. In addition, the laboratories help in the photography and examination of the scene of occurrence, gives lectures, and demonstration to police trainees, prosecutors and judges. The laboratories carry out research in forensic science.

The experts appear in courts whenever required to explain and prove their findings. Section 293 of Cr PC, 1973, has reduced the court attendances tremendously as the reports of the experts are admissible as evidence.

1.8.2 Other Institutions

In addition to forensic science laboratories, the following institutions provide scientific assistance to the criminal justice system in the delivery of real justice:

1.8.2.1 Fingerprint Bureau

All the major States in India have fingerprint bureaus. In addition, the Central Government also has a Central Finger Print Bureau located at Delhi under the Department of National Crime Record Bureau. The fingerprint records at the national level have been digitised and computerised. Any police force in India can utilise its services.

Fingerprint bureau experts perform many functions, including the following:

1. Collect, classify, and store the fingerprint record of the criminals.
2. Eliminate the record of the dead persons.
3. Search the fingerprints records of a given person for his correct identity.
4. Compare the disputed and specimen fingerprints.
5. Visit the crime scene to locate; collect and ultimately compare the fingerprint found at the scene.
6. Give evidence in courts (or on commission) whenever required.

1.8.2.2 Government Examiners of Documents

Some State Governments and some central departments have experts (Government Examiners of Documents) to examine disputed documents exclusively. For example, MHA, Government of India, had three such institutions, known as Government Examiner of Questioned Documents. The oldest one was located at Shimla (partly shifted to Chandigarh and likely to be located finally there). It started functioning somewhere around in 1906. The other two institutions are at Kolkata and Hyderabad. These institutions cater to the zonal needs of not only Central Government departments but also to the State Governments' needs. They have since been merged in the Central Forensic Laboratories at those places.

Some states have named their own document examining institutions as Document Bureaus. Most of the states have established document examination departments in their Forensic Science Laboratories.

1.8.2.3 CID Scientific Sections

Some police forces have scientific divisions in their CID departments, which help the department with technical photography, scientific surveillance, and cater for other technical needs.

1.8.2.4 Computer Divisions

There is hardly any police organisation now that does not have a computer division. The use of computers by police forces in India is yet limited. However, it is growing fast.

1.8.2.5 Chemical Examiners' Laboratories

The institution of Chemical Examiners' laboratories was the first step towards a scientific criminal investigation. The first Chemical Examiner's Laboratory was established in Chennai in 1849. Later the laboratories came up in all the major states (provinces). The main functions of these laboratories were:

- To ascertain poisoning, to identify the poison, to determine the quantity administered if the person had died of poisoning.
- To identify biological stains of all types but mainly blood and semen stains.
- Some Chemical Examiners' laboratories also examined liquors, narcotics, drugs, and food particles.

These exhibits, in many states, are examined by Public Analysts laboratories.

Today, the chemical examiners' laboratories, in most of the states, form part of the Forensic Science Laboratories. In some states, they continue to exist separately; where they perform mainly the first two functions, mentioned above. The analysis relating to liquor and narcotics are carried out by other specified laboratories often under the control of excise department or Narcotic Control Bureau.

1.8.2.6 Department of Explosives

The department of explosives is also a legacy of the 19th century. An Inspectorate of explosives was established in **1898**, at Nagpur. Additional units have since come up almost in all the important cities of India including Metropolitan cities. The Inspectorates of explosives used to handle explosives and explosions in criminal investigations and help mainly:

- To collect evidence from the scene of explosion;
- To identify the explosive(s) and explosive device(s) used in the explosion;
- To collect, identify, and inactivate the live explosive devices; and
- To provide guidelines for further investigations.

However, the department of explosives no longer assists the investigators. This work is gradually being taken over by the Forensic Science Laboratories. Additional help, especially in the disposal of live devices is being provided by:

- The bomb disposal squads of armed forces.
- National Security Guards. They also train the police to handle explosives and explosions.
- Bomb Disposal Squad, Delhi police.
- Bomb handling squads of some para-military forces.

1.8.2.7 Serologist to the Government of India

The Serologist to the Government of India was established in 1910 for the first time. It examined biological stains, particularly blood and semen stains. It thus, provided valuable assistance in a scientific criminal investigation for about 50 years in India. The institution still continues with diminished utility as almost all the Forensic Science Laboratories have their own serology division where the same work is being done perhaps with greater efficiency. Besides, the advent of DNA profiling has limited the utility of other serological tests. Most of the Forensic Science Laboratories have now DNA profiling facilities. Others are in the process of inducting expertise. No laboratory, worth the name, can afford to remain without the facility. Soon it will be available in all the forensic science laboratories.

1.8.2.8 Mobile Laboratories

Most of the States have mobile forensic science units to assist the police in the examination of the crime scene. They vary in number, staff, structure, and in the administrative control. The unit usually has a forensic scientist, a fingerprint expert, and a photographer. The mobile laboratories, at the scene of the crime, assist to:

- Ascertain the genuine or fake nature of the scene.
- Photograph the scene.

  Handle the physical evidence: help to locate, collect, and preserve the incriminating and sample evidentiary clues.

- Provide leads for further investigation, after preliminary evaluation of the evidence and the scene.
- Reconstruct the occurrence and the sequence of event: route of ingress, route of egress, and the number of participants.
- Indicate the nature of occurrence: murder, suicide, or accident.
- Evaluate the accident to determine the cause of the accident and the possible perpetrator.

The number of mobile laboratories in India is too small. There are about 800 districts. It is essential that there should be mobile units in all districts and in all big cities for better scientific criminal investigations.

1.8.2.9 University Departments

Specialists in various universities are highly qualified persons in their specialities. If some analytical work falling in their speciality is referred to them they carry out the analysis competently. The departments of anthropology, chemical technology, and psychology have been utilised in the past. The reference is usually made only when the required expertise or the equipment is not available in the departmental laboratory itself.

The teaching of Forensic Science[5] in the universities has been gathering momentum in the past few decades. Some of the teachers there offer their services on *pro-rata* fee basis, which is shared by the specialist and the university.

Most of these universities can provide expertise of the high order.

1.8.2.10 Medico-legal Institutes

The following institutions provided Medico-legal assistance in India:

- Medico-legal Institutes like the one at Bhopal.
- Medical Colleges; most of the medical colleges especially government medical colleges, have Forensic Medicine Departments. These colleges provide medico-legal expertise.
- Medical Research and referral institutions like All India Medical Institute of Medical Sciences at Delhi, and Postgraduate Institute at Chandigarh have Forensic Departments. They provide expertise.
- The offices of the Police Surgeons.
- Some Forensic Science Laboratories have also opened Medico-legal divisions.

Medico-legal assistance in scientific criminal investigations plays an important role. Post-mortem or medico-legal examination reveals:

- *corpus delicti*;
- nature of death (Suicide? Accident? Murder?);
- cause of death;
- time of death;
- nature and number of injuries, fake or otherwise, grievous or otherwise;

5. LNJPN, National Institute of Criminology and Forensic Science, Delhi has also started M. Sc. Course in Forensic Science.

- nature and the number of the weapon(s) used, and hence, indirectly the number of armed assailants;
- the presence or indication of other crimes (rape, sodomy) along with murder;
- personal identification data (sex, age, height, built, deformity, scars, tattoos, old bone injuries and disease,).

Elementary medico-legal assistance is available in all hospitals. Higher order of medico-legal expertise is available in the institutes mentioned above.

The medico-legal assistance is extremely poor in most of the states in India. The work is entrusted to the junior–most doctor who often makes a mess of the evidence. In some places, the authorities have improved the system. In serious cases, a team of doctors undertakes the work.

1.8.2.11 Private Consultancies

Private individuals and agencies are coming up in our country, increasingly, to provide scientific assistance to the needy in scientific criminal investigations. They are proving to be quite useful. However, yet the consultancy service is limited, with limited investments; though the expertise of very high order is available from the retired government experts. It is hoped that the situation changes for the better in the coming times as the demand and the paying capacity of the public improves.

Fig. 1.11
Private Forensic Detective

1.8.3 Quality Assurance

The fate of the accused persons often depends upon the findings of Forensic Scientist. It has to be ensured that he does not intentionally, negligently, or otherwise give wrong results. The following steps help to prevent his failure:

1. Quality Assurance: the processes, tools, and output of the expertise are well-established standards.
2. Accreditation of the Laboratory and the Experts is done.
3. Standardisation of the tools and techniques is appraised periodically.
4. The quantum of evidence, for proof, is fixed for each type of evidence.
5. Wherever possible automation is inducted in the examination of the evidence, to reduce the human error, and to increase the overall efficiency of the forensic work.
6. Periodic blind tests to ascertain that the expert, the equipment, and the procedures are properly functioning and carried out.

All the steps are essential to streamline the working of forensic science service. They are being adopted in India. However, the speed is slow.

Fig. 1.12
Sherlock Holmes at work

1.9 ADDITIONAL READINGS[6]

1. *Wiley Encyclopedia of Forensic Science,* Allan Jamieson and Andre Moenssens Editors-in-chief, John Wiley & Sons, Inc., 2016 (5 vol set)
2. *Encyclopedia of Forensic Sciences,* Seigel, J. *et al*. Editor in Chief, Elsevier, USA, 2011 (3 vol set).

6. The readings are mainly Forensic scientist's/researcher's fare.

APPENDIX A

ETHICS IN FORENSIC SCIENCE

1. Introduction

1. Ethics, literally speaking is the branch of philosophy concerned with human character and conduct and behaviour. It is the science of morals. Hence, ethics in Forensic Science is concerned with character, conduct, and morals of the Forensic Scientist *vis-a-vis* his work in the field, in his laboratory, in his office, in courts, towards his fellow professionals, suspects, investigators, lawyers, judges and towards the public at large.

2. The importance of the evidence tendered by Forensic Scientists cannot be over-emphasised. The lives and liberties of persons depend upon their findings. On the one hand, the innocent accused loses his life and liberty, on the other, a criminal may be let loose, endangering the lives and liberties of many more. I was once tendering evidence in a court of law against a criminal who had been tried earlier eleven times, for murders. This time, he had murdered his own father. Consider the following situations:

- If a bullet, recovered from the dead body of the victim, is identified in respect of a firearm recovered from a suspect, it links the firearm positively with the killing.
- In a case of rape-murder, if the semen stain is identified to be that of the suspect *via* a DNA profile, the identity of the rapist-murderer is established beyond reasonable doubts.
- Fingerprints in blood found on the door of the murder room, helps in identifying the murderer.

3. If this type of important evidence is allowed to be mangled and mauled by unethical practices, it shall be most unfortunate. Some kaleidoscopic patterns:

a. *In a case of dacoity-cum-murder in a bank, an individual was apprehended. He was "identified" by the bank officials in police identification parades. However, the clinching piece of evidence was a fingerprint allegedly lifted from the cash counter by the police. It was clinching because the accused also produced eyewitnesses who testified that the accused was serving them eats at about 50 kilometres away at the material time. The expert, however, identified that the lift bore the fingerprint from the left index finger of the accused. He was convicted for 40 years imprisonment.*

The accused/convict maintained throughout that he was not the culprit, but to no avail. He went in appeal but before going to the court, he engaged an expert to check the evidence of fingerprints. The findings of the expert were startling:

- *The lift was not in the departmental fingerprint powders. Instead, it was in 'ink', used in electrostatic (Xerox) machines.*
- *This size of the fingerprint on the lift was appreciably smaller than the specimen fingerprint size – indicating the former was probably taken when he was a boy.*
- *On investigation, it was found that the police had taken his fingerprint when he was a boy (about 20 years earlier). The print on police record tallied with the print on the lift, dimensionally, also.*

The court not only dismissed the case, and ordered suitable compensation to the accused/convict but also severely criticised the unethical behaviour of the investigating agency

including that of the fingerprints experts and ordered suitable action against the police-culprit(s).

b. *An established handwriting expert appeared, via special power-of-attorney, in the Punjab and Haryana High Court to cross-examine another handwriting expert, appearing on the opposite side, in an election petition case. The latter expert had identified the authorship of the signatures allegedly on a libellous letter by the client of the former expert. The letter could nullify the election of the legislator. The defending expert was sure, it appeared, about the correctness of the authorship findings of the opposing expert, so he did not appear as an expert to oppose the findings. However, to create doubts in the findings, he adopted a novel technique: There were dimensional differences in the questioned and specimen signatures. The defending expert would pick up each letter, point out the dimensional difference and ask if the other would admit the difference or not. As the dimensional differences existed, the latter had to agree. Thus, he picked up each letter, formation, etc., dramatically and went on until he covered all letters, formations, etc. In the end he asked:*

   "*You have admitted there are differences in all letters, formations of the signatures, would you not like to change your earlier opinion?"*

   With the novel technique, the expert tried to paint the right findings with a thick layer of doubts, to obscure the truth for the 'benefit' of the court! He did not tell any untruths, by giving false evidence by taking the witness stand.

   Ethical? Unethical??

c. *In a case of murder, the police sent a 12 bore cartridge case and a shotgun, the former allegedly taken from the scene and the latter from the suspect. The cartridge was found to have been fired from the alleged shotgun. The doctor had recovered a cushion wad (used in 12 bore cartridges) from the deceased at the time of post-mortem. The expert (who had established the gun-cartridge linkage) was asked if the cushion wad, was fired from the gun, at the time of giving evidence. It could be. So far so good. The snag lay in the fact that the cushion wad did not belong to the cartridge under reference. The expert realized the factum. However, neither he was asked nor he informed!*

   The "Truth"? yes!

   The "whole truth"? No!!

   Ethical/Unethical? Certainly unethical??

2. Tenets of Ethics

The main tenets of ethics in Forensic Science include:

1. The expert must be an honest and dedicated man of science, without any bias/sympathy to any of the parties involved
2. The scientist is qualified.
3. He must possess the necessary technology.
4. He bases his evidence upon properly generated empirical data. It does not emanate from his institution/hunch/conformational syndrome. The data meets the standards fixed by the professional body.
5. He is aware and has studied the contradictory (to his thesis) evidence/data and has accounted for it.

6. He is prompt in his answers. He admits ignorance of something he does not know.
7. He must tell the whole truth.
8. He must not succumb to pressure.
9. He must remain a man of science. He has no friends to save, no enemies to avenge
10. He should not only be honest but also look honest.

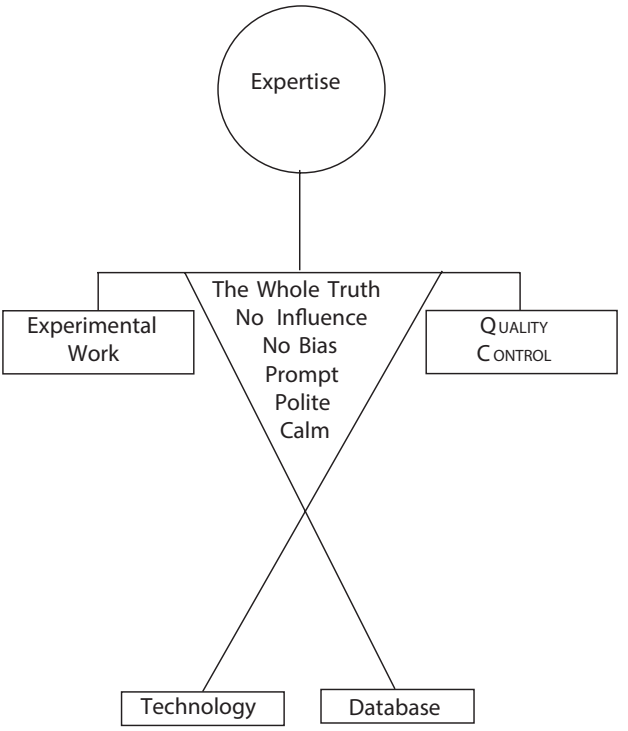


Fig. 1.13
Ethics in Forensics*

2.1 Qualified

Forensic Science is a highly specialized science, divided into a number of specialities. The person professing expertise in any branch must have the basic groundings:

- Basic education in science
- Training in the speciality
- Research in the same or related field
- Publications
- Participation in professional meetings/Seminars/Workshops
- Experience in the involved field
- Certification

Unfortunately, in our country (as elsewhere) some persons pose as experts without possessing adequate expertise. Yet with the felicity of tongue and easy conscience, they dispense cashable fake expertise and make an extra penny on garbled knowledge without having sound groundings. I know of:

- Fingerprint experts who have jumped into the bandwagon of handwriting experts.
- Toxicologists who profess expertise in Ballistics.
- Administrative officers in connected Forensic Science laboratories who practice everything scientific they heard of, in the laboratory.
- Police photographers, who, become handwriting experts/fingerprint/footprint/tool marks, etc.

All unethical, by all standards, I suppose!

In certain countries, there is a system of certification of experts by professional bodies. If the person has qualified the certification test, which is of an adequate standard, the person is properly qualified. In India, we have not introduced the system so far, we should.

2.2 Modern Technology

Practice in Forensic Science, these days, involve hi-tech, sophisticated gadgetry and shifting technologies. The technology is so costly that an ordinary citizen singly cannot possess the same. It is available in governmental institutions or other institutions organised by non-governmental or semi-governmental organisations.

Check points for adequate technology:

- Equipment
- Library — Literature, Internet
- Adequate consultancy — more than one experts
- Innovation/research facilities
- Database

The days of experts hoodwinking courts by their: "Colour-Corrected, auto-illuminated, forgery detection device", a name given to the simple magnifying lens (with light) should be over.

If a person is practising expertise without adequate equipment, he is debasing science. He has no means to generate the needed data. He depends upon his facile tongue and labile conscience. His depositions should not be relied upon.

Is he, or is he not unethical?

2.3 Database

All findings in Forensic Science are identifications of individuals, of materials, of patterns, of places, of situations. All identifications are based upon adequate data, generated by the experiments, observations, and evaluations of circumstances of the given evidence. This data has to be compared with the standard data already generated and stored (database). In some cases, it is generated with known standard samples as well as with blank experiments. The determination of the adequacy of generated data is based upon the experience of the expert and of other workers in the field. Sometimes professional bodies fix such norms.

Has the expert come up with the generated data? Does his data compare well with the data generated from the standards? Or, does his data compare well with prescribed laid down standards?

If the expert is not following the normal norms for evidential data, he is perhaps unethical!

Remember: 'From known (standards) to unknown (questioned entity)'!

2.4 Promptitude

The law has laid time limits for putting up challans in certain types of criminal cases. For example, under the PFA Act, 1955, as modified from time to time, the limit is 40 days. Under Cr. P.C., 1973 this time limit is 90 days. If the expert's report is sent after the prescribed limits; its value is lost. The criminal may get the benefit. "Justice delayed is justice denied".

I know of an officer who would send his reports relating to food analysis only technically before 40 days. Postal delays, office delays would often allow crossing of the limit. The cases would, thus, fall through in the courts.

Delays in Forensic Science are highly deplorable. The delays should be dispensed with. When the staff/work ratio is critical, it is better to refuse cases. — Send them to Central or other Forensic Science Institutes, — rather than accept them and keep them pending for months and years together. Some years ago, I visited a laboratory. Its Toxicology division had crateful of exhibits pending examination. Enquiries from the Director revealed that all the exhibits would need at least 10 years to clear the backlog alone with the present staff, provided. No more exhibits come came (which was impossible). How did he deal with them? He told that he would get examined only those cases in which courts passed orders for examination. The others would die their natural deaths (— cases decided!) exhibits putrefied!

Intentional delay is of course unethical. Is the delay due to heavy workload ethical/unethical; a moot question?

2.5 The Whole Truth

An expert witness, giving evidence in a court is required to take the oath:

> **I solemnly affirm (swear by ……..) that I shall tell the truth, the whole truth and nothing but the truth, so help me …….(God).**

In the initial stages of appearances in the court, the wording perhaps impresses the expert. But with the passage of time, he loses the importance of the word and the recital becomes just a necessary ritual — just like the recital of qualifications, experience, etc. However, the words of the oath are important. It requires of the expert to give "the whole truth and nothing but the Truth". What is "the whole truth"?

Consider the following cases:

a. *In a case of forgery, the disputed signatures, though obtained by trickery, were of the alleged person. Correct identification of the author would have exonerated the forger. There was insufficient other evidence to link him with the forgery. The expert was examined the case erroneously found that the evidence was not sufficient to identify the real author. His evidence thus went against the manipulator. The head of the department winked at the findings, though convinced otherwise!*

   Unethical?

b. *In a case of money transaction, the alleged borrower denied receiving any money or signing the document, promissory note (pronote). The court sent the document to the expert. The signatures of the borrower on the document did not tally with the signatures obtained as*

specimens. However, as a matter of routine the document was exposed to ultraviolet rays. Lo! The UV rays revealed chemically erased signature near the visible disputed signatures. The revealed signatures were of the borrower.

Sticking to the requested examination the author could not expose the fraud. Additional input, ultraviolet rays' examination revealed "the whole truth".

It appears that the court clerk had connived with the borrower in the fraud!

Ethical?

c. *In a case of attempted murder, the police sent one firearm and two fired cartridge cases to the laboratory. Examination revealed one cartridge had been fired from the firearm sent, the second shell was not.*

A week later, in another case, one firearm and two cartridge cases were received from the same police station. Again one cartridge was found fired from the sent firearm, the other was not. However, inter se check of the fired cartridges in the two cases, revealed that left out the cartridge in the first case was fired from the weapon received in the second case and vice versa. The reports were sent accordingly. The examination linked the two cases.

However the investigating officer came running, on receipt of the report. There was no link between the two cases. In fact, the firearm received in the first case was supposed to be in the laboratory when the second case occurred! He wanted to get the reports changed accordingly. He did not want "the whole truth!" The expert did not oblige the IO.

Ethical?

d. *In another case, two assailants who fired at the victim from close range allegedly killed the victim. There were three wounds on the deceased. According to the police two of them were entrance wounds and one was an exit wound. The post-mortem report did not discriminate between the entry and exit wounds. Were there really two entry wounds?*

Check on the shirt worn by the deceased in the courtroom revealed only one hole! It indicated one killer shot only—setting aside the police theory of two shots by two suspects. The court acquitted the accused!

Ethical?

e. *In an interesting case, a nephew shot dead his issueless moneyed uncle (father's brother) and aunt, while they were taking a stroll on their agricultural farm. He was sure that he would inherit the property after them.*

He was the prime suspect. He was tried for murder but the court acquitted him with epitaph—

"Insufficient evidence!"

Did he inherit the property? No. The law and the ballistics expert deprived of the fruits of crime, from the murder. The legal position is that in the case of the death of a spouse the survivor inherits the property of a couple. After the death of the survivor, the heirs of the survivor inherit it.

In this case, therefore it was essential to find out who was killed first.

The case was referred to the author. He studied the shotgun injuries on the deceased. The patterns of pellet spread, the site of the injuries and the range of fire indicated that the husband was fired at from a closer range. He died (killed) first. The lady was fired later and in all probability died later Thus the husband's property legally passed on to her (perhaps for a few seconds only), then to her legal heir(s), of course, different from the alleged murderer, who claimed the property.

"The Whole Truth" found by the expert from the evaluation of the injuries prevented the criminal from enjoying the fruits of crime.

Ethical? Of course!

The "whole truth" concept brings in real justice as it exposes the unethical machinations of the culprit and his co-manipulators. It prevents miscarriages of justice in trials.

It is ethical to find the 'whole truth' It is unethical bypass/ignore/suppress the 'whole truth'!

In short, the "whole-truth" sticklers have the following attributes:

1. He does not wink at the wrong action, real/implied/glossed over by others.
2. He does not promote/practise/accept half-truths.
3. He does make/accept 'honest mistakes'. The experts cannot afford to make mistakes. They must evolve processes, which must dispense with all possibilities of mistakes.— It should form part of the examination or evaluation system. It may be double or

triple self-check or repeat checks by subordinates, colleagues, superiors. In short, the results should be foolproof. The chances of 'Honest Mistakes' should be finished through periodic quality control checks. In expert evidence, there is 'no honest mistake'. It is outright negligence or bad intentions. Both are costly and criminal.

4. He sticks to the solemn oath: ….**"the truth, the whole truth and nothing but the truth"**: Truth for the presenting sides: truth for the defence, truth for the court; the whole truth: asked, or unasked, avoided or secreted, 'volunteered or objected to'.

   The whole truth must come forth as long as the courts permit/accept/give the opportunity to the forensic scientist.

2.6 Man of Science

A man of science is slightly different from other men. He does not depend upon conjectures, intuitions, inner voice, or a hunch, even if he has them. He may take them as possible, experiment upon them and collect evidence from these experiments. From the results, he draws inferences. He crosschecks them himself, gets them checked from his colleagues, subordinates and superiors and forms the final opinion from the total evidence. The evidence he presents, is data-based, open, visible, verifiable and could be evaluated and appreciated by all concerned given the necessary will and attention. It is objective (not subjective) evidence that he produces.

If it is a new field of investigation, he submits his experiments, observations and inferences to the scrutiny of fellow scientists in the same institution, in other institutions carrying out similar work, and in seminars, meetings and workshops. If his findings still stand the scrutiny after receiving repeated hammerings, it has passed the acid test.

The process was adopted, almost in its entirety, in the Biggar Murder case:

> *A girl was found murdered in the cemetery of a small town. The girl did not belong to the town and nobody had seen her alive in those parts. She had been strangulated to death manually. She had no evidence on her person or at the scene that could lead to the culprit except a bite mark on her breast. The police collected and preserved bite mark evidence (photographs, lifts).*
>
> *The investigation of the police led to the belief that one of the boys of the local college had committed the crime. There were 421 boys in the college at that time. Dental casts of all of them were obtained. Most of the students could be eliminated as suspect easily. Eleven dental casts were ultimately left for detailed examination. A team of dentists was constituted. The team identified the culprit.*
>
> *It was the first case of identity based solely on the 'bite marks' evidence. The evidence therefore, was submitted to other specialists of the country also. Nay, it was also sent to some renowned odontologists abroad.*
>
> *After massive consultations, the evidence was finalised and put up in the court. The court seeing the amount of work done and near unanimous findings of the specialists accepted the evidence and convicted the accused for murder on the sole evidence of bite mark.*

A man of science sticks to scientific process. He generates experimental data, he makes intensive observations, records the positive/negative data, determine the positive and negative odds and draws inference on the basis of preponderance of data. The man of science does not go beyond the dictates of data that he generated. He does not enter the realm of speculation. He does not extend or stretch the findings.

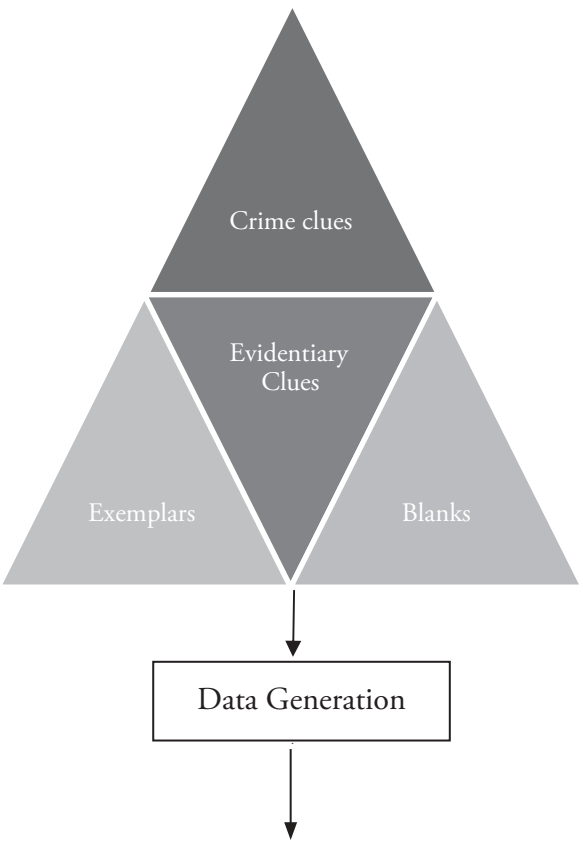
The man of science is a witness of science, not of individuals or parties. His finding may help one party or the other. Or, it may be just useless data from the court's point of view. The expert has to remain neutral, non-combatant, within the boundaries of generated data.

The man of science has no innocents to save, no culprits to punish. He is just to provide the information he has been able to generate from his examination of men, materials and situations.

In short, an ethical man of science:

1. Is steeped in scientific culture.
2. Is open to scrutiny/appraisal.
3. Is stickler to transparency/openness.
4. Has no friends, no foes, vis-à-vis his work.
5. Has no innocents to save, no culprits to punish.
6. Dives deep into the problem, to find the roots cause.
7. Sticks to scientific processes.
8. Generate adequate empirical data in support of his thesis.
9. Compares the generated data, with the standard data.
10. Bases his opinion on the quantum of required data.
11. Uses no dogmas, jargons no complex theories.
12. Appraises alternative possibilities/theories.
13. Collects data, both for and against the propositions.

2.7 Evidentiary Clues



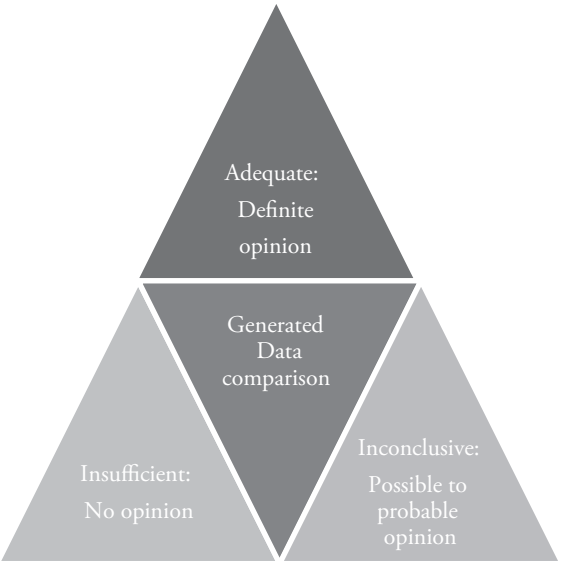


Fig. 1.14
Scientific process

2.8 Behaviour

The behaviour of Forensic Scientists in the court (and elsewhere) is important. The following aspects may be noticed.

1. Present day expert does not sit in the IVORY TOWERS. The general knowledge of the average man has gone up very high; thanks to governmental effort at universal education and also to the media (especially TV), they can understand most of the applications of Forensic Science — except perhaps the intricate instrumentation and details of the sophisticated techniques. The expert cannot get away with the plea that the evidence is technical and a non-expert cannot understand it. It is blasphemy, unethical misbehaviour!
2. The expert keeps his mental balance. Some defence counsels provoke the expert, to rattle him. They hope to get reports/answers that may not be completely correct. The expert must keep his cool even on provocation.
3. Sometimes the expert is asked to tender evidence in court. It is a bad practice. The court and the counsels lose the chance to know the evidence first hand and get clarifications of some parts of the evidence.
4. There is no prescribed court dress code for an expert in the court. However, the court does expect the expert to appear in a decent dress—the concept varies with places, times, customs and individuals. However, the formal dress prescribed by government for its employees should be used whenever possible.
5. Expert evidence is based upon experiments, observations and inferences. However, it is desirable to thrash them out with colleagues, subordinates, superiors,
6. Sometimes the defence counsel or the judge asks questions on some new facet of evidence when the expert is in the witness box. The correct answer may

need exploration, which in turn will need time for data generation, evaluation, comparison, The expert should not give half-cooked answer, which may not convey even half the truth. He requests the court to give him time to study/examine/evaluate the problem. The courts appreciate the intention and allow time.

Instant expertise demand is usually a defence counsel's trap to the expert. He should avoid it. Instant expertise can mislead at times. The demand is, therefore, unethical.

7. What should be the attitude of an ethical expert towards 'Yes'/ 'No' answers or towards hypothetical questions? Both are pitfalls and often mislead. Enlightened courts permit elaboration of the former and inhibit the latter. We must volunteer correct and full information with the permission of the court, even if a party objects to the explanation.
8. What should be the attitude of an ethical expert towards cases sent for a second opinion? This problem has been bother-some. Is it ethical to avoid the second examination? Or, is it ethical to take up? Perhaps, it is so. Refusal to examine the case is perhaps unethical.
9. Ethical behaviour of an expert, in the courts, includes:—
   - He is polite.
   - He stands by his findings. At the same time he is dogmatic.
   - He is respectful to the court/counsels. He does not ridicule their ignorance about the expertise.
   - He gives his best honestly, persuasively and in easily intelligible wording/illustrations/photographs, etc.
   - He answers the relevant question correctly, intelligibly and politely.
   - He does his best to promote real justice.

2.9 Bias

The scientific evidence has no place for bias. However, human beings handle the evidence. Every person has many infirmities, including-

1. Emotions: sympathy, anger
2. Likes and dislikes
3. Arbiter's feeling—the ego

It will be wrong to imagine that a person will be totally free from bias. However, a process is evolved where bias is controlled/reduced drastically. The following steps help:

- The background of the case is not intimated to the expert. If he does not know the history of the case, bias is eliminated in many cases.
- The involved parties are not allowed to meet the expert. The step prevents the development of bias. If he does not come in contact with the personalities involved, he does not develop sympathy/hostility towards their plight, accused/victim alike.
- He is an ethical man of science. If he 'plays the game', the bias is eliminated.
- Bias, theoretically speaking, is always present. But in real practice, it is minimal, especially when the expert work is streamlined and the examination is done by more than one expert.

- There is a danger of sub-conscious bias in the mind of the scientist. However, he strictly follows the scientific process, the sub-conscious bias stands eliminated.
- There is a mantra for the scientist to guard himself against subconscious bias. He may adopt it with advantage. The mantra is writing and recitation of the text:

"I have No bias. No friends to save. No enemies to punish.

Scientific data alone guides/controls my findings."

The scientist writes the mantra on opening the file and on closing the file. He recites the mantra every time when he handles the file.

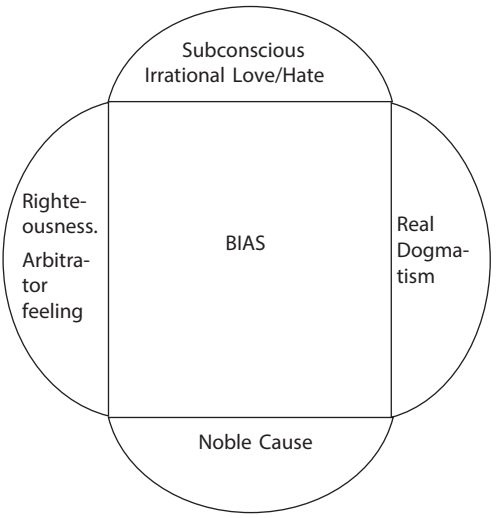


Fig. 1.15
Bias

2.10 Pressure—Influence?

Pressure, like bias, is ever present danger hanging like a sword of Damocles on the head of the expert. Politicians often try to influence directly, or indirectly. Some superior officers also try. Public—the involved persons, often try: Money, friendship, relationship threats are all used. If the scientist succumbs to the influence even once, he is sure to end up perhaps in a few cases a financial success but surely a mental and ethical wreck. Ethical men cannot bear the continued mental and emotional torture and end up in suicides, or contract serious physical, mental ailments.

When I was leaving university to join my job as Director CID Scientific Laboratory, in 1957, I went to the Head of the Department, a renowned Scientist, for his blessings. These blessings were unique. He said, Remember: Scientists in your new shoes commit suicide; Remember. He said no more, no less.

I related the same to my eldest brother. He reacted sharply and recited a couplet from Sheikh Sadi:

"*Kas Na Deedam Keh Gum Shud Uz Rahe Rast.*"

(I have not seen any person losing his way while following the right path)

Influence is against the truth. At times, resistance to influence becomes torturous and perhaps gives temporary career set back, but remember: "Even this shall pass away".

It is gratifying, perhaps, to know that those who can resist influence earn real respect from all concerned, even from those whose influence is resisted. I had personally been in conflict with two toughest Chief Ministers, who through their agents offered 'everything' for doctored reports. The resistance for the time being created fear for the 'consequences' but fortunately it passed off. Later rendezvous however, clearly indicated that my stand had earned respect and admiration from the individuals. Of course, I had to pay its price in the initial stages.

A lot of water has since flowed under the bridge. In these days of changing politics and frequently changing politicians with questionable moral and ethical background, in some cases at the helm of the affair and rampant corruption, it is practical to avoid taking sides. Next change of politicians may bring in wrath for the favours rendered to the outgoing ones. And you may be the scapegoat. In the prevailing circumstances perhaps; it is best not to bask in the anterooms of the powers that be, but be confined to the walls of the laboratories in anonymity. It is difficult; yet, a must for the ethical man.

In short, in not succumbing to influence, avoid it through:

1. Tact
2. Politeness
3. Firmness
4. Anonymity

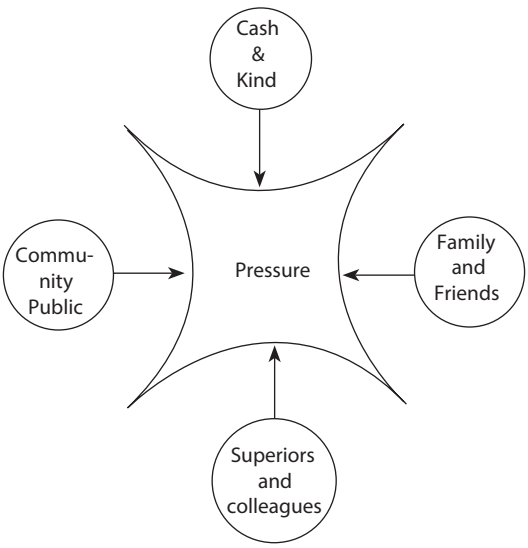


Fig. 1.16
Pressure

3. Conclusion

Forensic Science plays a crucial role in the dissemination of justice. Unethical practices in its functioning betray justice. A code of conduct (one of the three essential ingredients of ethics:

morals, character and conduct) is, therefore, essential for its practitioners. The Chief Forensic Scientist to the Government of India may take up the task.

Ethical conduct in the practice of Forensic Science has many facets:

- Scientific inputs (Si)
- Sound expertise (E)
- Adequate available technology (T)
- Prevalence of scientific work culture (W)

The ethics in Forensic Science (E_{FS},) therefore, is indicated by:

$$\mathbf{E_{FS} \propto S_i\,(E+T+W)} \tag{1}$$

Some ethical character factors have an inhibiting effect on the value of the expertise. They are:

- Bias (B)
- Pressure—influence (P).

Even the smallest amount of these factors destroys the values of the expertise as it affects the ethical character of the scientist inversely and exponentially. This aspect of ethic is graphically represented as under:

$$E_{FS} \propto \frac{1}{(B+P)} \tag{2}$$

It is somewhat modified by scientific environment prevailing in the country and in the criminal justice system. This factor may be represented by 'K'. Thus, the ethics (both conduct and character from (1) and (2) in Forensic Science may be formulated as (3):

$$E_{FS} = K\ \frac{Si\,(E+T+W)}{(B+P)} \tag{3}$$

1.10 SUPREME COURT CASES

(21st century)

1.10.1 Emerging Fields of Forensics[7]

Author's Summary

This is an unfortunate negative landmark SC judgment on noetic sciences, namely, *polygraph/ narco-analysis/the Brain Electrical Activation Profile (BEAP)* tests. It disallowed their effective use as evidence in courts and allowed their use in investigation only, subject to the consent of the accused.

The ruling, thereby, tacitly allowed the investigators to use their traditional III Degree modes in interrogation. It, thus, promote inhuman treatment of the suspect under interrogation.

The SC has ruled that for voluntary use of these scientific tests, the guideline provided by the Human Right Commission must be followed scrupulously.

Highlights italicised

7. *Selvi v State of Karnataka,* AIR 2010 SC 1974.

Relevant Extracts (Verbatim)

1. The legal questions in this batch of criminal appeals relate to the involuntary administration of certain scientific techniques, namely ***narcoanalysis, polygraph examination and the Brain Electrical Activation Profile (BEAP)*** test for the purpose of improving investigation efforts in criminal cases. This issue has received considerable attention since it involves tensions between the desirability of efficient investigation and the preservation of individual liberties. Ordinarily the judicial task is that of evaluating the rival contentions in order to arrive at a sound conclusion. However, the present case is not an ordinary dispute between private parties. It raises pertinent questions about the meaning and scope of fundamental rights which are available to all citizens. Therefore, we must examine the implications of permitting the use of the impugned techniques in a variety of settings.

2. Objections have been raised in respect of instances where individuals who are the accused, suspects or witnesses in an investigation have been subjected to these tests without their consent. Such measures have been defended by citing the importance of extracting information which could help the investigating agencies to prevent criminal activities in the future as well as in circumstances where it is difficult to gather evidence through ordinary means. In some of the impugned judgments, reliance has been placed on certain provisions of the Code of Criminal Procedure, 1973 and the Indian Evidence Act, 1872 to refer back to the responsibilities placed on citizens to fully co-operate with investigation agencies. It has also been urged that administering these techniques does not cause any bodily harm and that the extracted information will be used only for strengthening investigation efforts and will not be admitted as evidence during the trial stage. The assertion is that improvements in fact-finding during the investigation stage will consequently help to increase the rate of prosecution as well as the rate of acquittal. Yet another line of reasoning is that these scientific techniques are a softer alternative to the regrettable and allegedly widespread use of 'third degree methods' by investigators.

3. *The involuntary administration of the impugned techniques prompts questions about the protective scope of the 'right against self-incrimination' which finds a place in Article 20(3) of our Constitution. In one of the impugned judgments, it has been held that the information extracted through methods such as 'polygraph examination' and the 'Brain Electrical Activation Profile (BEAP) test' cannot be equated with 'testimonial compulsion' because the test subject is not required to give verbal answers, thereby falling outside the protective scope of Article 20(3). It was further ruled that the verbal revelations made during a narcoanalysis test do not attract the bar of Article 20(3) since the inculpatory or exculpatory nature of these revelations is not known at the time of conducting the test.*

To address these questions among others, it is necessary to inquire into the historical origins and rationale behind the 'right against self-incrimination'. The principal questions are whether this right extends to the investigation stage and whether the test results are of a 'testimonial' character, thereby attracting the protection of Article 20(3). Furthermore, we must examine whether relying on the test results or materials discovered with the help of the same creates a reasonable likelihood of incrimination for the test subject.

4. We must also deal with arguments invoking the guarantee of 'substantive due process' which is part and parcel of the idea of 'personal liberty' protected by article 21 of the Constitution. The first question in this regard is whether the provisions in the Code of Criminal Procedure, 1973 that provide for 'medical examination' during the course of an investigation can be read expansively to include the impugned techniques, even though the latter is not explicitly enumerated. To answer this question, it will be necessary to discuss the principles governing the interpretation of statutes in light of scientific advancements. Questions have also been raised with respect to the professional ethics of medical personnel involved in the administration of these techniques. Furthermore, article 21 has been judicially expanded to include a 'right against cruel, inhuman or degrading treatment', which requires us to determine whether the involuntary

administration of the impugned techniques violates this right whose scope corresponds with evolving international human rights norms. We must also consider contentions that have invoked the test subject's 'right to privacy', both in a physical and mental sense.

5. The scientific validity of the impugned techniques has been questioned and it is argued that their results are not entirely reliable. For instance, the narcoanalysis technique involves the intravenous administration of sodium pentothal, a drug which lowers inhibitions on part of the subject and induces the person to talk freely. However, empirical studies suggest that the drug-induced revelations need not necessarily be true. Polygraph examination and the BEAP test are methods which serve the respective purposes of lie-detection and gauging the subject's familiarity with information related to the crime.

These techniques are essentially confirmatory in nature, wherein inferences are drawn from the physiological responses of the subject. However, the reliability of these methods has been repeatedly questioned in empirical studies.

In the context of criminal cases, the reliability of scientific evidence bears a causal link with several dimensions of the right to a fair trial such as the requisite standard of proving guilt beyond a reasonable doubt.

* * *

7. At this stage, it will be useful to frame the questions of law and outline the relevant sub-questions in the following manner:

I. Whether the involuntary administration of the impugned techniques violates the 'right against self-incrimination' enumerated in article 20(3) of the Constitution?

I-A. Whether the investigative use of the impugned techniques creates a likelihood of incrimination for the subject?

I-B. Whether the results derived from the impugned techniques amount to 'testimonial compulsion' thereby attracting the bar of article 20(3)?

II. Whether the involuntary administration of the impugned techniques is a reasonable restriction on 'personal liberty' as understood in the context of article 21 of the Constitution?

It was unanimously held that the 'general acceptance' standard articulated in Frye (supra.) had since been displaced by the enactment of the Federal Rules of Evidence in 1975, wherein rule 702 governed the admissibility of expert opinion testimony that was based on scientific findings. This rule provided that:

> *If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.*

23. It was held that the trial court should have evaluated the scientific evidence as per rule 702 of the Federal Rules of Evidence which mandates an inquiry into the relevance as well as the reliability of the scientific technique in question. The majority opinion (Blackmun, J.) noted that the trial judge's step should be a preliminary assessment of whether the testimony's underlying reasoning or methodology is scientifically valid and whether it can be properly applied to the facts in issue. Several other considerations will be applicable, such as:

1. whether the theory or technique in question can be and has been tested
2. whether it has been subjected to peer review and publication
3. its known or potential error rate
4. the existence and maintenance of standards controlling its operation
5. whether it has attracted widespread acceptance within the scientific community

24. It was further observed that such an inquiry should be a flexible one, and its focus must be solely on principles and methodology, not on the conclusions that they generate. It was reasoned that instead of the wholesale exclusion of scientific evidence on account of the high threshold of proving "general acceptance in the particular field," the same could be admitted and then challenged through conventional methods such as cross-examination, presentation of contrary evidence and careful instructions to juries about the burden of proof. In this regard, the trial judge is expected to perform a 'gate-keeping' role to decide on the admission of expert testimony based on scientific techniques. It should also be kept in mind that Rule 403 of the Federal Rules of Evidence, 1975 empowers a trial judge to exclude any form of evidence if it is found that its probative value will be outweighed by its prejudicial effect.

* * *

1.10.2 Conclusion

221. *In our considered opinion, the compulsory administration of the impugned techniques*[8] *violates the 'right against self-incrimination'. This is because the underlying rationale of the said right is to ensure the reliability as well as voluntariness of statements that are admitted as evidence. This Court has recognised that the protective scope of Article 20(3) extends to the investigative stage in criminal cases and when read with section 161(2) of the Code of Criminal Procedure, 1973 it protects accused persons, suspects as well as witnesses who are examined during an investigation. The test results cannot be admitted in evidence if they have been obtained through the use of compulsion. Article 20(3) protects an individual's choice between speaking and remaining silent, irrespective of whether the subsequent testimony proves to be inculpatory or exculpatory. Article 20(3) aims to prevent the forcible 'conveyance of personal knowledge that is relevant to the facts in issue'. The results obtained from each of the impugned tests bear a 'testimonial' character and they cannot be categorized as material evidence.*

222. We are also of the view that forcing an individual to undergo any of the impugned techniques violates the standard of 'substantive due process' which is required for restraining personal liberty. Such a violation will occur irrespective of whether these techniques are forcibly administered during the course of an investigation or for any other purpose since the test results could also expose a person to adverse consequences of a non-penal nature. The impugned techniques cannot be read into the statutory provisions which enable medical examination during investigation in criminal cases, *i.e.,* the *Explanation* to sections 53, 53A and 54 of the Code of Criminal Procedure, 1973. Such an expansive interpretation is not feasible in light of the rule of '*ejusdem generis*' and the considerations which govern the interpretation of statutes in relation to scientific advancements.

> *We have also elaborated how the compulsory administration of any of these techniques is an unjustified intrusion into the mental privacy of an individual. It would also amount to 'cruel, inhuman or degrading treatment' with regard to the language of evolving international human rights norms. Furthermore, placing reliance on the results gathered from these techniques comes into conflict with the "right to fair trial". Invocations of a compelling public interest cannot justify the dilution of constitutional rights such as the 'right against self-incrimination'.*
>
> *223. In light of these conclusions, we hold that no individual should be forcibly subjected to any of the techniques in question, whether in the context of investigation in criminal cases or otherwise. Doing so would amount to an unwarranted intrusion into personal liberty. However, we do leave room for the voluntary administration of the impugned techniques in the context of criminal justice, provided that certain safeguards are in place. Even when the subject has given consent to undergo any of these tests, the test results by themselves cannot be admitted as evidence because the subject does not exercise conscious control over the responses during the administration of the test. However, any information or material that is subsequently discovered with the help of voluntary administered test results can be admitted, in accordance with section 27 of the Evidence Act, 1872.*

8. Polygraph Test, Narco-analysis, and Brain Electrical Activation Profile.

The National Human Rights Commission had published 'Guidelines for the Administration of Polygraph Test (Lie Detector Test) on an Accused' in 2000. These guidelines should be strictly adhered to and similar safeguards should be adopted for conducting the 'Narcoanalysis technique' and the 'Brain Electrical Activation Profile' test.

The text of these guidelines has been reproduced below:

(i) No Lie Detector Tests should be administered except on the basis of the consent of the accused. An option should be given to the accused whether he wishes to avail such test.

(ii) If the accused volunteers for a Lie Detector Test, he should be given access to a lawyer and the physical, emotional and legal implication of such a test should be explained to him by the police and his lawyer.

(iii) The consent should be recorded before a Judicial Magistrate.

(iv) During the hearing before the Magistrate, the person alleged to have agreed should be duly represented by a lawyer.

(v) At the hearing, the person in question should also be told in clear terms that the statement that is made shall not be a "confessional" statement to the Magistrate but will have the status of a statement made to the police.

(vi) The Magistrate shall consider all factors relating to the detention including the length of detention and the nature of the interrogation.

(vii) The actual recording of the Lie Detector Test shall be done by an independent agency (such as a hospital) and conducted in the presence of a lawyer.

(viii) A full medical and factual narration of the manner of the information received must be taken on record.

1.10.3 Brain Mapping[9]

Author's Summary

A.K. Telgi, a master forger, committed forgery and fraud on an unprecedented scale. He looted thousands of crores of rupees by producing and selling fake stamp paper. He was convicted for the crime; though the SC did not accept the new type of evidence (brain printing) produced by the prosecution dubbing it was vague and not well established.

Highlights italicised

Relevant Extracts (Verbatim)

III. According to the prosecution, the following circumstance could not be explained by the applicant.

(a) The fact that he had closed door meeting with A.K. Telgi in isolation between himself and A.K.L. Telgi only to the exclusion of other high ranking officers (Statement of ACP Supriya Patil at Page No. 11912. DCP (HQ) Koregaonkar at Page No. 11898 and DCP Jay Jadhav at Page No. 111940).

(b) The applicant knew A.K.L. Telgi even when he was at Mumbai earlier is also apparent from the statement of DCP Vasant Koregaonkar (Page No. 11898).

9. *Ranjitsing Brahmajeetsing Sharma v State of Maharashtra*, AIR 2005 SC 2277 : AIR 2005 SCW 2215 : 2005 Cr LJ 2533.

(c) Brain Maping (P. 300) of AKL Telgi, shows that he had given positive responses to the question relating to payment made to the applicant, favour shown by the applicant in Pune cases and facilities provided in Mumbai custody by the applicant (Page No. 12960 to 12963)."

13. The plea taken by the Appellant herein about his innocence was rejected by the High Court.

87. *Apart from the fact that nothing has been brought on record to show as to how far a report of brain mapping test can be relied upon, the report appears to be vague. It appears, the Respondents themselves did not want to put much reliance on the said report.*

88. Furthermore, the admissibility of a result of a scientific test will depend upon its authenticity. Whether the brain mapping test is so developed that the report will have a probative value so as to enable a court to place reliance thereupon, is a matter which would require further consideration, if and when the materials in support thereof are placed before the Court.

89. In *Frye v United States,* [293 F 1013 (DC Cir) (1923)], the principles to determine the strength of any investigation to make it admissible were stated in the following terms:

> Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in the twilight zone the evidential force must be recognized, and while the Courts will go a long way in admitting the expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

90. *Frye* (supra), however, was rendered at a time when the technology, the polygraph test, was in its initial stage and was used in few laboratories. The guidelines issued therein posed a threat of lack of judicial adaptation of the new developments and ignored the reliability on a particular piece of evidence.

1.10.4 Nirbhaya Rape-murder[10]

Author's Summary

It is a landmark judgment where the judges have utilised Forensic Science extensively for the dissemination of justice in this case of inhuman brutal rape- murder case.

The facts of the case are that the victim Nirbhaya, along with her friend (PW- 1) boarded a bus going to Dwarka/Palam. They noticed that six persons were already inside the bus. The accused did not allow anyone else to board. The bus moved and the inside lights of the bus were put off. A few minutes later, three persons (identified as accused Ram Singh, Akshay and a juvenile) started to abuse. Pw-1 objected that led to altercation. The two other joined the melee. PW-1 was beaten badly. He became immobile. Nirbhaaya was raped by all the six mauled, her so beastly/brutally that she died a few days later, in spite of the best medical help.

The police did an excellent job of locating and using all the available scientific evidence (CCTV footage for the identification of bus, fingerprints, bite marks, hair, DNA to inter-link the victims and the culprits) and presented an airtight case.

All the courts (trial/ high courts and the Supreme Court) appreciated the evidence. They found it **'rarest of the rare cases'** and sentenced them to death, excluding the juvenile.

Highlights italicised

10. *Mukesh v State for NCT Delhi*, Criminal Appeal Nos. 607–608 of 2017, decided on 5 May 2017 (SC). Bench: Dipak Misra, R Banumathi, Ashok Bhushan.
The Supreme Court has discussed the evidence relating to DNA, Bite Marks and Fingerprint lucidly, with numerous case citations.

Relevant Extracts (Verbatim)

1. The prosecution case, as projected, is that on 16 December 2012, the deceased, 'Nirbhaya' (not her real name), had gone with her friend, the informant, PW- 1, to the PVR situated in Select City Walk Mall, Saket to watch a movie. After the show was over, about 8:30 p.m., they took an auto and reached Munirka bus stand wherefrom they boarded a white coloured chartered bus [DL- 1P-C-0149, Ext.P1] which was bound to Dwarka/Palam Road, as a boy in the bus was calling for commuters for the said destination. As per the version of the informant, PW-1, the friend of the prosecutrix, the bus had yellow and green lines/stripes and the word "Yadav" was written on it.

2. After both of them had entered the bus, they noticed that six persons were already inside the bus, four in the cabin of the driver and two behind the driver's cabin. The deceased and the informant sat on the left side in the row of two-seaters and paid the fare of twenty rupees as demanded. Before they could get the feeling of a safe journey (though not a time-consuming journey), a feeling of lonely suffocation and a sense of danger barged in, for the accused persons did not allow anyone else to board and the bus moved and the lights inside the bus were put off. With the lights being put off, the darkness and the fear of the unexpected darkness ruled.

3. A few minutes later, three persons (who have been identified as accused Ram Singh, Akshay and a young boy, who has been treated as a juvenile in conflict with the law) came out of the driver's cabin and started to abuse PW- 1. The young companion of the deceased raised opposition to the abuse that led to an altercation which invited the other two who were sitting outside the driver's cabin to join.

4. The spirit to oppose and the duty to save the prosecutrix had to die down and perilously succumb to the assault by the accused persons with the iron rods that caused injuries to his head, both the legs and other parts of the body and the consequence was that he fell on the floor of the bus to hear the painful cries of the lady who, he knew, was being treated as an object, an article for experimentation and prey to the pervert proclivity of the six but could do nothing except to hear unbearable cries made in agony and pain. His spirit was dead, and bound to.

5. As the prosecution story further unfurls, the two accused persons, namely, Pawan and Vinay, pinned the young man down and robbed the victims of their mobiles besides robbing the informant of his purse carrying a Citi Bank credit card, ICICI Bank Debit Card, his identity card issued by his employer-company, metro card, a sum of rupees one thousand, his Titan Watch, a golden ring studded with jewels and a silver ring studded with pearl, black colour Hush Puppies shoes, black colour Numero Uno jeans, a grey colour pullover and a brown colour blazer. As per the version of the prosecution, PW-1 was carrying two mobiles and the prosecutrix was carrying only one, and the accused snatched away all the three mobiles.

6. The overpowering was not meant to satisfy the avarice. As the accusations proceed, after the informant was overpowered, as it could only have a singular result, the accused persons, namely, Ram Singh, Akshay and the Juvenile in Conflict with Law (JCL) took the prosecutrix to the rear side of the bus and she was raped by them, one after the other.

7. After committing rape, the accused Ram Singh (since deceased), accused Akshay and the JCL came towards the informant, PW-1, and nailed him down; then the accused Vinay and accused Pawan went to the rear side of the bus and committed rape on the prosecutrix, one by one. PW-1 noticed that earlier the bus was moving at fast speed but after some time, he felt that the speed of the bus was reduced and he saw that the accused Mukesh, who was driving the bus, came near him and hit him with the rod and he also went to the rear side of the bus and raped the prosecutrix.

The prosecutrix was brutally gang raped by the accused one after the other and she was also subjected to unnatural sex. Her private parts and her internal organs were seriously injured by inserting an iron rod and hand in the rectal and vaginal region. As per PW-1, he had heard the cries of the prosecutrix like "chod do, bachao". PW-1 could hear the prosecutrix shouting in a loud oscillating voice. The prosecutrix was carrying a grey colour purse having an Axis Bank ATM card and other belongings.

The accused persons robbed her of her belongings and stripped her. They also took away the clothes of the informant while beating him with iron rods. The accused were exhorting that both the victims be not left alive. The accused then tried to throw both the informant and the prosecutrix out of the moving bus from its rear door but could not open it and so, they brought them to the front door and threw them out of the moving bus at National Highway No. 8, Hotel Delhi 37, Mahipalpur flyover by the side of the road.

8. As indicated earlier, the prosecutrix and PW-1 were noticed by PW-72, Raj Kumar, who heard the voice of 'bachao, bachao' from the left side of the road near a milestone opposite to Hotel Delhi 37. PW-72 saw PW-1 and the prosecutrix sitting naked having blood all around. Immediately thereafter, PW-72, Raj Kumar, informed PW-70, Ram Pal, who was in the Control Room, requesting him to call PCR. PW-70, Ram Pal, of EGIS Infra Management India (P) Limited, dialled 100 No. and even asked his other patrolling staff to reach the spot.

9. About 10:24 p.m., PW-73, H.C. Ram Chander, who was in charge of PCR van Zebra 54, received information about the incident and the lying of victims in a naked condition near the foot of Mahipalpur flyover towards Dhaula Kuan opposite GMR Gate. PW-73 reached the spot and found the victims. He got the crowd dispersed and brought a bottle of water and a bedsheet from the nearby hotel and tore the same into two parts and gave it to both the victims to cover themselves.

Collection of samples and identity of accused persons

32. The blood sample of the informant was collected by Dr. Kamran Faisal, PW-15, Safdarjung Hospital, on 25.12.2012 and was handed over to SI Pratibha Sharma, PW-80, vide seizure memo Ex.PW-15/A by Constable Suresh Kumar, PW-42. Similarly, as mentioned earlier, PW-49, Dr. Rashmi Ahuja, had collected certain samples from the person of the prosecutrix which are reflected in Ex.PW-49/A from point B to B. All the samples were collected by Inspector Raj Kumari, PW-59, vide seizure memo Ex.PW-59/A and were handed over to PW-80, SI Pratibha Sharma, at Safdarjung Hospital in the morning of 17.12.2012.

Also the samples of gangrenous bowels of the prosecutrix were taken on 24.12.2012 and were handed over to SI Gajender Singh, PW-55, who seized the same vide seizure memo Ex.PW-11/A. All the samples were deposited with the MHC(M) and were not tampered with in any manner. A specimen of scalp hair of the prosecutrix was also taken on 24.12.2012 by Dr. Ranju Gandhi, PW-29, and was handed over to PW- 80, SI Pratibha Sharma, vide seizure memo Ex.PW-29/A.

33. The accused were also subjected to medical examination and samples were taken from their person which were sent for DNA analysis.

34. The *DNA analysis was done at the behest of PW-45, Dr. B.K. Mohapatra, Sr. Scientific Officer, Biology, CFSL, CBI, and Biological Examination and DNA profiling reports were prepared which are exhibited as Ex. PW-45/A-C. The report, after analysing the DNA profiles generated from the known samples of the prosecutrix, the informant, and each of the accused, concluded that: "An analysis of the above shows that the samples were authentic and established the identities of the persons mentioned above beyond reasonable doubt."*

35. On 17 December 2012 and 18 December 2012, a team of experts from the CFSL went to Thyagaraj Stadium and ***lifted chance prints from the bus*** in question, Ex.P-1. On 28.12.2012, PW-78, Inspector Anil Sharma of P.S. Vasant Vihar, the then S.H.O. of Police Station Vasant Vihar, requested the Director, CFSL, for taking digital palm prints and footprints of all the accused persons vide his letter Ex.PW-46/C. Pursuant to the said request made by PW-78, Inspector Anil Sharma, the CFSL, on 31.12.2012, took the finger/palm prints and footprints of the accused persons at Tihar Jail.

After comparing the chance prints lifted from the bus with the fingerprints/palm prints and footprints of all the accused persons, PW-46, Shri A.D. Shah, Senior Scientific Officer (Finger Prints), CFSL, CBI submitted his report Ex.PW- 46/D. In the report, the chance prints of accused Vinay Sharma were found to have matched with those on the bus in question.

36. ***Bite mark analysis was also undertaken by the investigative team to establish the identity and involvement of the accused persons. PW-66, Asghar Hussain, on the instructions of the I.O., S.I. Pratibha Sharma, had taken 10 photographs of different parts of the body of the prosecutrix at SJ Hospital on 20.12.2012 between 4:30 p.m. and 5:00 p.m. which were marked as Ex.PW-66/B (Colly.) [10 photographs of 5" × 7" each] and Ex.PW-66/C (Colly.) [10 photographs of 8" × 12" each]. PW-66 also proved in Court the certificate provided by him in terms of Section 65-B of the Evidence Act in respect of the photographs, Ex. PW-66/A.***

Thereafter, PW-18, SI Vishal Choudhary, collected the photographs and the dental models from Safdarjung Hospital on 01.01.2013 and duly deposited the same in the malkhana after he, PW-18, had handed them over to the S.H.O. Anil Sharma, PW-78. The same were later entrusted to S.I. Vishal Choudhary, PW-18 on 02.01.2013, which is proved vide RC No.183/21/12 and exhibited as Ex.PW-77/V. PW-71, Dr. Ashith B. Acharya, submitted the final report in this regard which is exhibited as Ex. PW-71/C. In the said report, he has concluded that at least three bite marks were caused by accused Ram Singh whereas one bite mark has been identified to have been most likely caused by accused Akshay.

Thereafter, on 03.01.2013, the report of the CFSL was received. In fact, the trial court had assured itself of the correct identification of the bus by playing the said CCTV footage shown in the pen drive, Ex.PW-67/1, and the CD, Ex.PW-67/2, during the cross-examination of PW-67, Pramod Jha.

98. Learned counsel Mr. Singh has asserted that bus, Ex. P-1, has been falsely implicated in the present case as is evidenced from the recovery of the CCTV footage. In an attempt to discredit the CCTV footage, he pointed out that only the CCTV recording alleged to be of this bus was recorded and not of all other white buses that had 'Yadav' written on them. The learned counsel for the defence subsequently maintained that the CCTV footage cannot be relied upon as the same has been tampered with by the investigating officers.

99. PW-76, Gautam Roy, HOD, Computer Cell, Forensic Division, has testified that on 02.01.2013, he had received two sealed parcels sealed with the seal of PS and the seals tallied with the specimen seals provided. He marked the blue coloured pen drive found in parcel No.1 as Ex.1 and the Moser Baer CD found in the second parcel as Ex.2. He further testified that both the exhibits were played by him on the computer and the bus was seen twice, at 9:34 p.m. and 9:54 p.m.

He had photographed all these three by freezing the pen drive and the CD and these photographs were compared by him with the photographs taken by the photographer, PW-79, P.K. Gottam, which he had summoned. The witness testified that he had prepared the three comparison charts in this regard as Ex.PW-76/B, PW-76/C and PW-76/D, and his detailed report as Ex.PW-76/E.

The footage taken in a CD and pen drive was sealed in PW-67's presence and as the recording was automatic data being fed on regular basis into the hard disk, the question of tampering with the

same could not arise. PW-79, P.K. Gottam, from CFSL, CBI, has stated in his examination that he took photographs of the bus bearing No.DL- 1P-C-0149 parked at Thyagaraj Stadium, INA, New Delhi from different angles on 17.12.2012 and 18.12.2012 and handed over the same to PW-76. The said photographs were marked as B1 in Ex.PW-76/B; as C1 and C2 in Ex.PW-76/C; and as D1 in Ex.PW-76/D. He has deposed as to the genuineness of the photographs by deposing that the software used for developing the photographs was tamper proof.

100. Once it is proved before the court through the testimony of the experts that the photographs and the CCTV footage are not tampered with, there is no reason or justification to perceive the same with the lens of doubt. The opinion of the CFSL expert contained in the CFSL report marked as Ex.PW-76/E authenticates that there was no tampering or editing in both the exhibits, Ex.P-67/1 and Ex.P- 67/2, and that a bus having identical patterns as the one parked at Thyagraj Stadium is seen in the CCTV footage, which includes the word "Yadav" written on one side, "back side dent (left)" and absence of wheel cover on the front left side. The contents of the report is also admitted to be true by its author, PW-76, Gautam Roy. Quite apart from that, it is perceptible that the High Court, in order to satisfy itself, had got the CCTV footage played during the hearing and found the same to be creditworthy and acceptable. 157.

207. *Having dealt with the aspect pertaining to insertion of rod, it is apposite to advert to the medical evidence and post mortem report. We have, while dealing with other aspects, referred to certain aspects including* ***DNA analysis*** *of medical evidence but the same requires to be critically dealt with as the prosecution has placed heavy reliance upon it.*

208. DNA is the abbreviation of Deoxyribonucleic Acid. It is the basic genetic material in all human body cells. It is not contained in red blood corpuscles. It is, however, present in white corpuscles. It carries the genetic code. DNA structure determines human character, behaviour and body characteristics. DNA profiles are encrypted sets of numbers that reflect a person's DNA makeup which, in forensics, is used to identify human beings. DNA is a complex molecule. It has a double helix structure which can be compared with a twisted rope 'ladder'.

209. The nature and characteristics of DNA had been succinctly explained by Lord Justice Phillips in Regina v Alan James Doheny & Gary Adams[83]. In the above case, the accused were convicted relying on results obtained by comparing DNA profiles obtained from a stain left at the scene of the crime with DNA profiles obtained from a sample of blood provided by the appellant. In the above context, with regard to DNA, the following was stated by Lord Justice Phillips: "Deoxyribonucleic acid, or DNA, consists of long ribbon-like molecules, the chromosomes, 46 of which lie tightly coiled in nearly every cell of the body. These chromosomes - 23 provided from the mother and 23 from the father at conception, form the genetic blueprint of the body. Different sections of DNA have different identifiable and discrete characteristics.

When a criminal leaves a stain of blood or semen at the scene of the crime it may prove possible to extract from that crime stain sufficient sections of DNA to enable a comparison to be made with the same sections extracted from a sample of blood provided by the suspect. This process is complex and we could not hope to describe it more clearly or succinctly than did Lord Taylor C.J. in the case of Deen (transcript: December 21, 1993), so we shall gratefully adopt his description. "The process of DNA profiling starts with DNA being extracted from the crime stain and also from a sample taken from the suspect. In each case the DNA is cut into smaller lengths by specific enzymes. The fragments produced are sorted according to size by a process of electrophoresis.

This involves placing the fragments in a gel and drawing them electromagnetically along a track through the gel. The fragments with smaller molecular weight travel further than the heavier ones. The pattern thus created is transferred from the gel onto a membrane. Radioactive DNA probes, taken from elsewhere, which bind with the sequences of most interests in the sample DNA are then applied. After the excess of the DNA probe is washed off, an X-ray film is placed over the membrane

to record the band pattern. This produces an auto radiograph which can be photographed. When the crime stain DNA and the sample DNA from the suspect have been run in separate tracks through the gel, the resultant auto-radiographs can be compared. The two DNA profiles can then be said either to match or not.""

210. In the United States, in an early case Frye v United States [84], it was laid down that scientific evidence is admissible only if the principle on which it is based is substantially established to have general acceptance in the field to which it belonged. The US Supreme Court reversed the above formulation in Daubert v Merrell Dow Pharmaceuticals, Inc.[85] stating thus: "11. Although the Frye decision itself focused exclusively on "novel" scientific techniques, we do not read the requirements of Rule 702 to apply specially or exclusively to unconventional evidence. of course, well- established propositions are less likely to be challenged than those that are novel, and they are more handily defended. Indeed, theories that are so firmly established as to have attained the status of scientific law, such as the laws of thermodynamics, properly are subject to judicial notice under Fed.Rule Evid.201.

13. This is not to say that judicial interpretation, as opposed to adjudicative fact finding, does not share basic characteristics of the scientific endeavour: "The work of a judge is in one sense enduring and in another ephemeral... In the endless process of testing and retesting, there is a constant rejection of the dross and a constant retention of whatever is pure and sound and fine." B.Cardozo, The nature of the Judicial Process 178, 179 (1921)."

211. The principle was summarized by Blackmun, J., as follows: "To summarize: "general acceptance" is not a necessary precondition to the admissibility of scientific evidence under the Federal Rules of Evidence, but the Rules of Evidence-especially Rule 702-do assign to the trial judge the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand. Pertinent evidence based on scientifically valid principles will satisfy those demands. The inquiries of the District Court and the Court of Appeals focused almost exclusively on "general acceptance," as gauged by publication and the decisions of other courts. Accordingly, the judgment of the Court of Appeals is vacated and the case is remanded for further proceedings consistent with this opinion."

212. After the above judgment, the DNA Test has been frequently applied in the United States of America. In District Attorney's Office for the Third Judicial District et al. v William G. Osborne[86], Chief Justice Roberts of the Supreme Court of United States, while referring to the DNA Test, stated as follows: "DNA testing has an unparalleled ability both to exonerate the wrongly convicted and to identify the guilty. It has the potential to significantly improve both the criminal justice system and police investigative practices.

The Federal Government and the States have recognized this, and have developed special approaches to ensure that this evidentiary tool can be effectively incorporated into established criminal procedure-usually but not always through legislation. ... ... Modern DNA testing can provide powerful new evidence unlike anything known before. Since its first use in criminal investigations in the mid- 1980s, there have been several major advances in DNA technology, culminating in STR technology. It is now often possible to determine whether a biological tissue matches a suspect with near certainty. While of course many criminal trials proceed without any forensic and scientific testing at all, there is no technology comparable to DNA testing for matching tissues when such evidence is at issue."

213. DNA technology as a part of Forensic Science and scientific discipline not only provides guidance to the investigation but also supplies the Court accrued information about the tending features of identification of criminals. The recent advancement in modern biological research has regularized Forensic Science resulting in radical help in the administration of justice. In our country also like several other developed and developing countries, DNA evidence is being increasingly relied

upon by courts. After the amendment in the Criminal Procedure Code by the insertion of Section 53A by Act 25 of 2005, DNA profiling has now become a part of the statutory scheme. Section 53A relates to the examination of a person accused of rape by a medical practitioner.

214. Similarly, under Section 164A inserted by Act 25 of 2005, for medical examination of the victim of rape, the description of material taken from the person of the woman for DNA profiling is a must. Section 53A sub-section (2) as well as Section 164(A) sub-section (2) are to the following effect:

"Section 53A. Examination of a person accused of rape by Medical Practitioner.-

(1) ... ...

(2) The registered medical practitioner conducting such examination shall, without delay, examine such person and prepare a report of his examination giving the following particulars, namely:- the name and address of the accused and of the person by whom he was brought, the age of the accused, marks of injury, if any, on the person of the accused, the description of material taken from the person of the accused for DNA profiling, and other material particulars in reasonable detail. Section 164A. Medical Examination of the victim of rape.-

(1) ... ...

(2) The registered medical practitioner, to whom such woman is sent, shall, without delay, examine her person and prepare a report of his examination giving the following particulars, namely:- the name and address of the woman and of the person by whom she was brought; the age of the woman; the description of material taken from the person of the woman for DNA profiling; marks of injury, if any, on the person of the woman; general mental condition of the woman; and other material particulars in reasonable detail."

215. This Court had the occasion to consider various aspects of DNA profiling and DNA reports. K.T. Thomas, J. in Kamti Devi (Smt.) and another v Poshi Ram[87], observed:

"10. We may remember that Section 112 of the Evidence Act was enacted at a time when the modern scientific advancements with deoxyribonucleic acid (DNA) as well as ribonucleic acid (RNA) tests were not even in contemplation of the legislature. The result of a genuine DNA test is said to be scientifically accurate. ..."

216. In Pantangi Balarama Venkata Ganesh v State of Andhra Pradesh[88], a two-Judge Bench had explained as to what is DNA in the following manner:

"41. Submission of Mr Sachar that the report of DNA should not be relied upon, cannot be accepted. What is DNA? It means: "Deoxyribonucleic acid, which is found in the chromosomes of the cells of living beings is the blueprint of an individual. DNA decides the characteristics of the person such as the colour of the skin, type of hair, nails and so on. Using this genetic fingerprinting, identification of an individual is done like in the traditional method of identifying fingerprints of offenders.

The identification is hundred per cent precise, experts opine." There cannot be any doubt whatsoever that there is a need of quality control. Precautions are required to be taken to ensure preparation of high molecular weight DNA, complete digestion of the samples with appropriate enzymes, and perfect transfer and hybridization of the blot to obtain distinct bands with appropriate control. (See the article of Lalji Singh, Centre for Cellular and Molecular Biology, Hyderabad in DNA profiling and its applications.) But in this case there is nothing to show that such precautions were not taken.

42. Indisputably, the evidence of the experts is admissible in evidence in terms of Section 45 of the Evidence Act, 1872. In cross-examination, PW 46 had stated as under: "If the DNA fingerprint of a person matches with that of a sample, it means that the sample has come from that person only. The probability of two persons except identical twins having the same DNA fingerprint is around 1 in 30 billion world population.""

217. In Santosh Kumar Singh v State Through CBI[89], which was a case of a young girl who was raped and murdered, the DNA reports were relied upon by the High Court which were approved by this Court and it was held thus:

"71. We feel that the trial court was not justified in rejecting the DNA report, as nothing adverse could be pointed out against the two experts who had submitted it. We must, therefore, accept the DNA report as being scientifically accurate and an exact science as held by this Court in Kamti Devi v Poshi Ram (supra). In arriving at its conclusions the trial court was also influenced by the fact that the semen swabs and slides and the blood samples of the appellant had not been kept in proper custody and had been tampered with, as already indicated above. We are of the opinion that the trial court was in error on this score. We, accordingly, endorse the conclusions of the High Court on Circumstance 9."

218. In Inspector of Police, Tamil Nadu v John David[90], a young boy studying in MBBS Course was brutally murdered by his senior. The torso and head were recovered from different places which were identified by the father of the deceased. For confirming the said facts, the blood samples of the father and mother of the deceased were taken which were subject to the DNA test. From the DNA, the identification of the deceased was proved. Paragraph 60 of the decision is reproduced below: "60. ... The said fact was also proved from the DNA test conducted by PW 77. PW 77 had compared the tissues taken from the severed head, torso and limbs and on scientific analysis he has found that the same gene found in the blood of PW1 and Baby Ponnusamy was found in the recovered parts of the body and that therefore they should belong to the only missing son of PW 1."

219. In Krishan Kumar Malik v State of Haryana[91], in a gang rape case when the prosecution did not conduct DNA test or analysis and matching of semen of the appellant-accused with that found on the undergarments of the prosecutrix, this Court held that after the incorporation of Section 53- A in CrPC, it has become necessary for the prosecution to go in for DNA test in such type of cases. The relevant paragraph is reproduced below:

"44. Now, after the incorporation of Section 53-A in the Cr.P.C w.e.f 23.06.2006, brought to our notice by the learned counsel for the respondent-State, it has become necessary for the prosecution to go in for DNA test in such type of cases, facilitating the prosecution to prove its case against the accused. Prior to 2006, even without the aforesaid specific provision in CrPC the prosecution could have still restored to this procedure of getting the DNA test or analysis and matching of semen of the appellant with that found on the undergarments of the prosecutrix to make it a foolproof case, but they did not do so, thus they must face the consequences."

220. In Surendra Koli v State of Uttar Pradesh [92], the appellant, a serial killer, was awarded the death sentence which was confirmed by the High Court. While confirming the death sentence, this Court relied on the result of the DNA test conducted on the part of the body of the deceased girl. Para 12 is reproduced below:- "12. The DNA test of Rimpa by CDFD, a pioneer institute in Hyderabad matched with that of blood of her parents and brother. The doctors at AIIMS have put the parts of the deceased girls which have been recovered by the doctors of AIIMS together. These bodies have been recovered in the presence of the doctors of AIIMS at the pointing out by the accused Surendra Koli. Thus, recovery is admissible under Section 27 of the Evidence Act."

221. In Mohammed Ajmal Mohammad Amir Kasab alias Abu Mujahid v State of Maharashtra[93], the accused was awarded death sentence on charges of killing a large number of innocent persons on 26th November, 2008 at Bombay. The accused with others had come from Pakistan using a boat 'Kuber' and several articles were recovered from 'Kuber'. The stains of sweat, saliva and other bodily secretions on those articles were subjected to DNA test and the DNA test matched with several accused. The Court observed:

222. In Sandeep v State of Uttar Pradesh[94], the facts related to the murder of pregnant paramour/girlfriend and unborn child of the accused. The DNA report confirmed that the appellant

was the father of the unborn child. The Court, relying on the DNA report, stated as follows: "67. In the light of the said expert evidence of the Junior Scientific Officer it is too late in the day for the appellant Sandeep to contend that improper preservation of the foetus would have resulted in a wrong report to the effect that the accused Sandeep was found to be the biological father of the foetus received from the deceased Jyoti.

As the said submission is not supported by any relevant material on record and as the appellant was not able to substantiate the said argument with any other supporting material, we do not find any substance in the said submission. The circumstance, namely, the report of DNA in having concluded that accused Sandeep was the biological father of the recovered foetus of Jyoti was one other relevant circumstance to prove the guilt of the said accused."

223. In Rajkumar v State of Madhya Pradesh[95], the Court was dealing with a case of rape and murder of a 14 year old girl. The DNA report established the presence of semen of the appellant in the vaginal swab of the prosecutrix. The conviction was recorded relying on the DNA report. In the said context, the following was stated:

"8. The deceased was 14 years of age and a student in VIth standard which was proved from the school register and the statement of her father Iknis Jojo (PW1). Her age has also been mentioned in the FIR as 14 years. So far as medical evidence is concerned, it was mentioned that the deceased prosecutrix was about 16 years of age. So far as the analysis report of the material sent and the DNA report is concerned, it revealed that semen of the appellant was found on the vaginal swab of the deceased. The clothes of the deceased were also found having appellant's semen spots. The hair which was found near the place of occurrence was found to be that of the appellant."

224. In Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik and another[96], the appellant, father of the child born to his wife, questioned the paternity of the child on the ground that she did not stay with him for the last two years. The Court directed for a DNA test. The DNA result opined that the appellant was not the biological father of the child. The Court also had the occasion to consider Section 112 of the Evidence Act which raises a presumption that birth during marriage is conclusive proof of legitimacy. The Court relied on the DNA test holding the DNA test to be scientifically accurate. The pertinent observations are extracted below:

"19. The husband's plea that he had no access to the wife when the child was begotten stands proved by the DNA test report and in the face of it, we cannot compel the appellant to bear the fatherhood of a child, when the scientific reports prove to the contrary. We are conscious that an innocent child may not be bastardised as the marriage between her mother and father was subsisting at the time of her birth, but in view of the DNA test reports and what we have observed above, we cannot forestall the consequence. It is denying the truth. "Truth must triumph" is the hallmark of justice.

20. As regards the authority of this Court in Kamti Devi, this Court on appreciation of evidence came to the conclusion that the husband had no opportunity whatsoever to have liaison with the wife. There was no DNA test held in the case. In the said background i.e. non-access of the husband to the wife, this Court held that the result of DNA test "is not enough to escape from the conclusiveness of Section 112 of the Act."

The judgment has to be understood in the factual scenario of the said case. The said judgment has not held that DNA test is to be ignored. In fact, this Court has taken note of the fact that the DNA test is scientifically accurate. We hasten to add that in none of the cases referred to above, this Court confronted with a situation in which a DNA test report, in fact, was available and was in conflict with the presumption of conclusive proof of legitimacy of the child under Section 112 of the Evidence Act.

In view of what we have observed above, these judgments in no way advance the case of the respondents." From the aforesaid authorities, it is quite clear that DNA report deserves to be accepted unless it is absolutely dented and for non- acceptance of the same, it is to be established that there had

been no quality control or quality assurance. If the sampling is proper and if there is no evidence as to tampering of samples, the DNA test report is to be accepted.

225. In order to establish a clear link between the accused persons and the incident at hand, the prosecution has also adduced scientific evidence in the form of DNA, fingerprint and bite mark analysis.

226. Various samples, for the purpose of DNA profiling, were lifted from the person of the prosecutrix; the informant; the accused, their clothes/ articles; the dumping spot; the iron rods; the ashes of partly burnt clothes; as well as from the offending bus. PW-45, Dr. B.K. Mohapatra, analysed the said DNA profiles and submitted his report thereof. In his report, he concluded that the samples were authentic and capable of establishing the identities of the persons concerned beyond a reasonable doubt.

Guidelines and methodology documented in the Working Procedure Manuals of the laboratory which have been validated and recommended for use in the laboratory. He further added that once a DNA profile is generated, its accuracy is 100%. The trial court and the High Court have consistently noted that the counsel for the defence did not raise any substantial ground to challenge the DNA report during the cross-examination of PW-45. In such circumstances, there is no reason to declare the DNA report as inaccurate, especially when it clearly links the accused persons with the incident.

227. After establishing the identities of each of the accused persons, the informant and the prosecutrix through DNA analysis, ***the DNA profiles*** *generated from the remaining samples, where the identity of biological material found thereon needed to be ascertained, were matched with the DNA profiles of the prosecutrix, the informant and the accused, generated earlier from known samples. Such an analysis cogently linked each of the accused with the victims as also with the crime scene. A summary of the findings in the report submitted by PW-45, Dr. B.K. Mohapatra, is as under:*

"S.No.	*Accused*	*DNA EVIDENCE*
1	*Ram Singh*	*Rectal swab from the prosecutrix contained DNA of male origin, which was found consistent with the DNA developed from the blood sample of this accused.*
		DNA profile developed from the blood stains from the underwear, T-shirt and slippers of this accused was found consistent with the DNA of the prosecutrix.
2	*Mukesh*	*DNA profile developed from the blood stains from the pants, T-shirt and jacket of this accused was found consistent with the DNA of the prosecutrix.*
3	*Akshay*	*Breast swab of the prosecutrix contained DNA of male origin which was found consistent with the DNA of this accused.*
		DNA profile developed from the blood stains from the jeans of this accused was found consistent with the DNA of the prosecutrix.
4	*Vinay*	*DNA profile developed from the blood stains from the underwear, jacket and slippers of this accused was found consistent with the DNA of the prosecutrix.*
5	*Pawan*	*DNA profile developed from the blood stains from the sweater and shoes and slippers of this accused was found consistent with the DNA of the prosecutrix."*

228. Further, a summary of the DNA analysis of the biological samples lifted from the material objects such as the bus, the iron rods, and the ash and unburnt pieces of clothes is also worth producing here:

"Serial No.	*Identity of the Victim*	*Findings of DNA Analysis*
	Informant	*The DNA profile developed from burnt cloth pieces were found to be of male origin and was consistent with the DNA profile of complainant.*
		The bunch of DNA profile developed from hair and blood stained pieces of paper recovered from the bus was found consistent with the DNA profile of complainant.
		The DNA profile developed from blood stained dried leaves collected from the place where both the victims were thrown matched with the DNA profile of complainant.
	Prosecutrix	*The DNA profile developed from blood stains from both the iron rods recovered at the instance of accused Ram Singh from bus was of female origin and was consistent with the DNA profile of prosecutrix.*
		The DNA profile developed from blood stains from curtains of the bus matched with the DNA profile of prosecutrix.
		The DNA profile developed from blood stains from seat covers was found consistent with the DNA profile of prosecutrix.
		DNA profile developed from blood stains from the bunch of the hair recovered from floor of the bus below sixth row seat, blood stains prepared from the roof of the bus near back gate, blood stains prepared from the floor of the bus near back gate, blood stains taken from side of back stairs of the bus, and blood stains taken from the inner side of the back door of the bus was found consistent with the DNA profile of prosecutrix.

230. Mr. Sharma, learned counsel appearing for appellants - Mukesh and Pawan Kumar Gupta, submitted that in the instant case, the DNA test cannot be treated to be accurate, for there was blood transfusion as the prosecutrix required blood and when there is mixing of blood, the DNA profiling is likely to differ. It is seemly to note, nothing had been put to the expert in his cross-examination in this regard. As the authorities relating to DNA would show, if the quality control is maintained, it is treated to be quite accurate and as the same has been established, we are compelled to repel the said submission of Mr. Sharma.

The evidence relating to finger print analysis:

231. Next aspect that is required to be adverted is the **evidence of fingerprint analysis** adduced by the prosecution to establish the identity of the accused persons. By virtue of the finger print analysis, the prosecution has tried mainly to establish the presence of the accused in the offending bus. On 17.12.2012 and 18.12.2012, a team of experts from the CFSL had lifted chance finger prints from the concerned bus, Ex.P-1, at Thyagraj Stadium. On 28.12.2012, PW-78, Inspector Anil Sharma of P.S. Vasant Vihar, the then S.H.O. of Police Station Vasant Vihar, requested the Director, CFSL for taking digital palm prints and foot prints of all the accused persons vide his letter Ex.PW-46/C. Pursuant to the said request made by PW-78, Inspector Anil Sharma, the CFSL on 31.12.2012 took the finger/palm prints and foot prints of the accused persons at Tihar Jail. After comparing the chance prints lifted from the bus with the finger prints/palm prints and foot prints of all the accused persons, PW-46, Shri A.D. Shah, Senior Scientific Officer (Finger Prints), CFSL, CBI, submitted his report, Ex.PW-46/D.

232. As per the report, Ex.PW-46/D, the result of the aforesaid examination of the Finger Print Division of the CFSL, CBI, New Delhi was that the chance prints of accused Vinay Sharma were found on the bus in question. The relevant portion of the report is as under:

Result of Examination

1. The chance print marked as Q.1 is identical with left palmprint specimen of Vinay Sharma S/o Sh. Hari Ram Sharma marked here as LPS-28 on the slip marked here as S.28 (Matching ridge characteristics have been found in their relative positions in the chance palmprint and specimen palm print. This forms the basis of the opinion that these prints are identical. Eight of them have been marked with projected red lines with their detailed description are placed at Annexure-1)

II. The chance print marked as Q.4 is identical with right thumb impression of Vinay Sharma S/o Sh. Hari Ram Sharma marked here as RTS-23 on the slip marked here as S.23 (Matching ridge characteristics have been found in their relative positions in the chance print and specimen finger print. This forms the basis of the opinion that these prints are identical. Eight of them have been marked with projected red lines with their detailed description are placed at Annexure-2)." The above report incontrovertibly proves that accused Vinay was present in the bus at the time of the incident. Be it noted, the other chance prints were found to be unfit for comparison or different from specimen print.

The comparison also shows that there is a concordance in terms of general alignment and angulation of the biting surfaces of the teeth of the lower jaw on the dental models of the accused person with the name Akshay and the corresponding bite marks visible on Photograph No.5. In particular, the comparison revealed concordance between the biting surface of the teeth on the lower jaw of the dental models of the accused person with the name Akshay and the bite mark visible on Photograph No.5 in relation to the rotated left first incisor whose mesial surface pointed towards the tongue.

Overall, the bite mark shows some degree of specificity to the accused person's teeth by virtue of a number of concordant points, including one corresponding unconventional/ individual characteristic. There is an absence of any unexplainable discrepancies between the bite mark and the biting surfaces of this accused person's teeth. Therefore, the teeth on the dental models of the accused person with the name Akshay probably caused the bite marks visible on Photograph No.5."

239. Be it noted, the present is a case where the victim's body contained various white bite marks. Bite mark analysis plays an important role in the criminal justice system. Advanced development of technology such as laser scanning, scanning electron microscopy or cone-beam computed tomography in forensic odontology is utilised to identify more details in bite marks and in the individual teeth of the bite. Unlike fingerprints and DNA, bite marks lack the specificity and durability as the human teeth may change over time.

However, bite mark evidence has other advantages in the criminal justice system that links a specific individual to the crime or victim. For a bite mark analysis, it must contain abundant information and the tooth that made the mark must be quite distinctive.

240. Bite marks in the skin are photographed in cases where the suspect is apprehended. A thorough dental combination is administered after dental examination of the suspect. A final comparison of the details of the original mark with the dentation of the suspect is done by experts.

241. The bite marks generally include only a limited number of teeth. The teeth and oral structure of the accused are examined by experts and, thereafter, bite marks are compared and

reports are submitted. Forensic Odontology is a science and the most common application of Forensic Odontology is for the purpose of identification of persons from their tooth structure.

242. Forensic Odontology has established itself as an important and indispensable science in medico-legal matters and expert evidence through various reports which have been utilized by courts in the administration of justice. In the case at hand, the report is wholly credible because of matching of bite marks with the tooth structure of the accused persons and there is no reason to view the same with any suspicion. Learned counsel for the appellants would only contend that the whole thing has been stage- managed. We are not impressed by the said submission, for the evidence brought on record cogently establish the injuries sustained by the prosecutrix and there is consistency between the injuries and the report. We are not inclined to accept the hypothesis that bite marks have been managed. Acceptability of the plea of alibi

> **Aggravating circumstances**: A court may, however, in the following cases impose the penalty of death in its discretion:
>
> (a) if the murder has been committed after previous planning and involves extreme brutality; or
>
> (b) if the murder involves exceptional depravity; or
>
> (c) if the murder is of a member of any of the armed forces of the Union or of a member of any police force or of any public servant and was committed-
>
> (i) while such member or public servant was on duty; or
>
> (ii) in consequence of anything done or attempted to be done by such member or public servant in the lawful discharge of his duty as such member or public servant whether at the time of murder he was such member or public servant, as the case may be, or had ceased to be such member or public servant; or
>
> (d) if the murder is of a person who had acted in the lawful discharge of his duty under Section 43 of the Code of Criminal Procedure, 1973, or who had rendered assistance to a Magistrate or a police officer demanding his aid or requiring his assistance under Section 37 and Section 129 of the said Code." After reproducing the same, the Court opined: "Stated broadly, there can be no objection to the acceptance of these indicators but as we have indicated already, we would prefer not to fetter judicial discretion by attempting to make an exhaustive enumeration one way or the other.

333. Thereafter, the Court referred to the suggestions pertaining to mitigating circumstances: "Mitigating circumstances.-In the exercise of its discretion in the above cases, the court shall take into account the following circumstances:

(1) That the offence was committed under the influence of extreme mental or emotional disturbance.

(2) The age of the accused. If the accused is young or old, he shall not be sentenced to death.

(3) The probability that the accused would not commit criminal acts of violence as would constitute a continuing threat to society.

(4) The probability that the accused can be reformed and rehabilitated. The State shall by evidence prove that the accused does not satisfy the conditions (3) and (4) above.

(5) That in the facts and circumstances of the case the accused believed that he was morally justified in committing the offence.

(6) That the accused acted under the duress or domination of another person.

(7) That the condition of the accused showed that he was mentally defective and that the said defect impaired his capacity to appreciate the criminality of his conduct." The Court then observed: "We will do no more than to say that these are undoubtedly relevant circumstances and must be given great weight in the determination of sentence."

357. When we cautiously, consciously and anxiously weigh the aggravating circumstances and the mitigating factors, we are compelled to arrive at the singular conclusion that the aggravating circumstances outweigh the mitigating circumstances now brought on record. Therefore, we conclude and hold that the High Court has correctly confirmed the death penalty and we see no reason to differ with the same.

CHAPTER 2

CRIME, CRIMINAL & CRIMINAL INVESTIGATION

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ESSENTIALS OF CRIMINAL INVESTIGATION

1. Criminal Investigation is prerogative of the police. Other official/non-official organisations/individuals also investigate crime.
2. It has two branches: Reactive and Proactive. Former is reaction task to a committed crime. Proactive activity is to pre-empt/control the impending/ongoing crime.
3. It aims to find truth of the incident: Crime? Accident? Self-created fraud (suicide!)/ fake crime or an Act of God.
4. It locates, identifies, arrests, and detains the suspect criminals as per law.
5. It's ideal objectives are to fix *corpus delicti*, if it exists, to locate/identify the culprit/ victim/witness/weapon of offence/*modus operandi*/associates, etc.
6. It recovers looted/stolen money and property.
7. It searches incriminating evidence and hidden valuables, document the recoveries, preserve them, and get them evaluated from experts to prove the guilt of the accused beyond a reasonable doubt.
8. It fixes the location of exchanged connecting clues from all possible sources (the scene, the victim, the culprit, the vehicle used, and the places visited after committing the crime), documenting them, preserving them, and getting them evaluated from concerned experts.
9. It involves interviews/interrogations of the victim/culprits/suspects witnesses.
10. It tends to deter the would–be criminal to commit more crimes.
11. It satisfies the victims of crime.
12. It utilizes services of scientists who use both classical and modern tools and techniques. Computers, Digital Forensics, Forensic Biometrics, DNA profiling, GS-MS spectrometry, and SEM are assisting the criminal investigation in a big way to achieve its objectives.
13. It utilizes criminal profiling and *Modus Operandi* to identify an unknown criminal.
14. It uses informants, undercover agents, wiretapping, and electronic surveillance to reach the criminal and his associates. These tools and techniques have acquired tremendous importance in relatively recent times.
15. It is increasingly using noetic sciences [PDD (Lie Detector), Brain Profiling, and Narco Analysis) for interrogation in place of III Degree Methods of yester years.
16. It utilizes the databases compiled by the police (NCRB in India) for crimes, criminals, and objects for efficient solution of the crime.

2.1 CRIME[1]

Crime, in sociological parlance, is the deviant behaviour of a person *vis-à-vis* the established or accepted standards of behaviour of a society. The deviance is from the social, religious, educational, and political norms of the society. It is time variant and region variant and is affected by the religious beliefs and social practices of the crime affected people.

1. A wit has described crime in a funny way: "**commission of crime is not a crime but being caught for the same is crime**".

Crime, in legal parlance, is an act, which is against the laws of the land. The act adversely affects the victim (a person, a group of persons, or the society as a whole). Usually the element of intension/motive lurks behind the criminal act.

For orderly, normal, and proper societal functioning, the legal concept of crime prevails. It is an act of an individual or individuals that involves breach of the established rules or laws, usually enacted law: national or international laws, or the rules and norms of a functional group, society, or of a community.

The crime as a legal concept varies from country to country, society to society, and even from locality to locality. Some of the examples are:

1. Gay marriage is not an offence in some countries, while in others, it is unlawful at present but there is a move to make them legal.[2]
2. Driving after consuming limited amount of liquor is allowed in certain jurisdiction, not in others.
3. Possession of firearms requires licence in some countries, and not in others.
4. Production of liquor for home consumption is allowed in certain areas of Himachal Pradesh, and not in other parts of the same state.

The concept of crime is time-variant. *Sati* was an honoured custom among the Rajputs in India, in olden days. It is a serious crime today.

Some tribes in Africa and at other places used to abandon their aged relative in jungles where they would die of hunger, natural elements, or were killed by the jungle beasts. It is illegal in most of the societies.

The latest concept of crime is that it is *the violation of human rights.*

2.1.1 Classification of Crime

Crime has been classified in various forms. The common traditional classification divides crime into two main classes:

1. Offences against person
2. Offences against property
3. Crimes against State

In the Indian Penal Code, 1860 the offences have been grouped into chapters.[1] The nature of the crimes and the punishments thereof has been discussed therein. The offences in various Chapters are:

V. Of Abetment
VA. Criminal Conspiracy
VI. Of Offences against the State
VII. Of Offences relating to the Army, [3][Navy and the Air force]
VIII. Of Offences relating to Public Tranquility
IX. Of Offences by or relating to Public Servants

2. In August 2017, a Bench of nine Supreme Court judges pronounce judgment that "**personal privacy**" is a fundamental right. It also indicated that gay marriages also comes under personal privacy.
[1]See Chapters V to XXIII of the Indian Penal Code, 1860.
3. Subs. by Act 10 of 1927, section 2 and Sch I, for "AND NAVY".

IXA. Of Offences relating to Elections

X. Of Contempt of the Lawful Authority of Public Servants

XI. Of False Evidence and Offences against Public Justice

XII. Of Offences relating to Coins and Government Stamps

XIII. Of Offences relating to Weights and Measures

XIV. Of Offences affecting the Public Health, Safety, Convenience, Decency, and Morals

XV. Of Offences relating to Religion

XVI. Of Offences affecting the Human Body

XVII. Of Offences against Property

XVIII. Of Offences relating to Documents and to [4][***] Property Marks

XIX. Of the Criminal Breach of Contracts of Service

XX. Of Offences relating to Marriages

XXA. Of Cruelty by Husband or Relatives of Husband

XXI. Of Defamation

XXII. Of Criminal Intimidation, Insult, and Annoyance

XXIII. Of Attempts to Commit Offences

The first four Chapters discuss definitions and other preliminaries.

The National Crime Record Bureau (**NCRB**), Ministry of Home Affairs, and the Government of India has also classified the crime *via* victimology. The major classes, given by the NCRB, are:

1. Violent Crimes
2. Crime against Women
3. Crime against Children
4. Crime against Scheduled Castes and Scheduled Tribes
5. Property Crimes
6. Cybercrimes

The detailed delineations of the offences and punishment thereof confer legitimacy to the Indian law.

The Indian Constitution proclaims that all are equal before law and the law is the same for all. It has promoted the phrase **"All are equal before the law".** It is a different thing that, in practice, some are more equal than others; of course, through misuse of pelf and power!

The major types of modern crimes, in addition to the traditional crimes, which are proving to be a severe worry to the law keepers and the public are:

1. Terrorism
2. Corruption
3. Money Laundering

4. The words "TRADE OR" omitted by Act 43 of 1958, section 135 and Sch (w.e.f. 25-11-1959).

4. Black Money in Foreign Banks (Secret Accounts)
5. Cybercrimes including internet and computer crimes
6. Misuse of mobile phone
7. Drug Abuse, their illegal manufacture and trade
8. Organised Crime
9. Illegal arms manufacture, trade, and trafficking
10. Juvenile Delinquency
11. Smuggling and drug trafficking
12. Political Crime
13. Public Order Crime

In addition to the above classifications of crime, India has some peculiar crimes that are more or less native to the country. They are:

1. **Honour Killing:** If a young person marries in a caste that is prohibited by the elders, the couple is killed. The Indian law does not permit honour killing and considers such killings as murders. But the *Khap Panchayats*[5] not only approve but also order such murders.
2. **Female Foeticide/Infanticide**: A number of social evils are responsible for female foeticide. Religious demands for a male issue, to continue the lineage, dowry requirements at marriage, and inability to find suitable boy for the girl are some of the major reasons for female foeticide. Additionally, the sex-determination test during pregnancy has facilitated foeticide. Quite a few private clinics carry out the test illegally and help pregnant woman to abort the foetus. The law is against both the tests and the abortions, nevertheless both are flourishing unabated.
3. **Dowry Deaths**: Many bridegrooms and their parents expect the parents and the relatives of the bride to give substantial dowry to the groom and his kith and kin. If the dowry is below their expectations, they start pestering the bride, some murder the bride while others force them to commit suicide.

   There are stringent laws against dowry deaths. However, they are ineffective and the evil continues.

2.1.2 Causes of Crime

There are many causes of crime. They are people variant and time variant. In olden days, the main causes of crime were grouped in three categories, all starting with **'Z'**:

1. Zun (woman)

The women, in olden days, was a potent source of crime in most of the societies. Adultery, rape, kidnapping and their possession were the cause of many a crime including wars (Allauddin-Padmini!).

2. Zamin (land)

Land was the main source for subsistence in olden days and land disputes often arose which sometimes led, even today, to murders. It is a historical fact that the fertile Indo-Gangetic plains of India have attracted invaders time and again in the past.

5. A self-styled panchayat of the village elders. They decide Honour killings.

3. Zar (Property: money, jewellery and valuables)

Zar had been beckoning and still beckons many evil minds for a variety of crimes. Theft, robbery, dacoity, kidnappings for ransom, smuggling and trading in narcotics, illegal arms trade are crude heinous crimes of the muscleman. However, the educated has gone to collect hundreds of crores of rupees through forgeries, frauds, counterfeiting currency (even stamp papers!) and trading in spurious or imitation products to rake in crores of rupees. Cuts and commissions for business and other favours have been filling the coffers of the bigwigs (political leaders, administrators, and business men) in no uncertain terms. They are raking in the tainted **Zar** and have stashed lakhs of crores of rupees in foreign bank coffers in secret bank accounts, identified by only numbers!

Other important causes of crime are:

1. Lust for power: Political crimes (political murders, grabs, scams, bribes (corruption), quotas, subsidies, promoting families, and kith and kin).
2. Religious fanaticism.
3. Revenge for real or imaginary insults, humiliations, and the like.
4. Disparity [economic, social], hunger versus lavish wastage.
5. Psychopathy (inborn mental emotional imbalance and aberration): Sex maniac, serial killers, kleptomaniac, schizophrenics, and the like.
6. Honour killing.
7. Provocations.
8. Nurture (environment, association, differential treatment, personal, familial, and social disorganisation).
9. Loss of faith in God's dispensation and in religious teachings.
10. Change in social values.
11. Rise of subcultures, rise of terrorism, and *fidayeen* (suicide squads).

The knowledge relating to the causes of crime and their control is important. They form important investigative and research fields with the psychologist and the sociologist. A lot of research work goes on to understand the problems and find effective preventive, detective, and remedial measures for the same.

2.1.3 Is it crime?

A crime is usually discriminated from accidents, act of God, suicides. It is identified from:

1. The presence of *corpus delicti* of the crime; it varies tremendously, depending on the nature of a crime and the *modus operandi* of the criminal. For example, in an alleged murder, the dead body is the *corpus delicti*. In explosions, the presence of explosive or its decomposed fragments are the *corpus delicti*.
2. The information furnished by genuine eyewitnesses.
3. The appraisal of the circumstantial evidence.

2.2 CRIMINAL

2.2.1 Who is a Criminal?

"Who is criminal?" It is a simple question in common parlance. Any person who commits a crime is a criminal. In legal terms, it becomes complicated. In law, a person committing a crime

is not a criminal unless a court finds that the evidence produced proves that he has committed a crime beyond reasonable doubt and the judge declares him a criminal. The person is just a "suspect" or an "accused" until a judge pronounces him a criminal. The police suspects an individual(s) for committing a crime; investigates the crime to identify the criminal (and the victim sometimes); to find evidence against the suspect; and to dub him as an "accused". If the police find sufficient evidence against suspect/culprit, it goes to the court with the evidence. The court decides whether the evidence produced by the prosecution is sufficient to identify him as a criminal beyond any reasonable doubt and the accused is then a criminal. If the evidence is insufficient the accused or the suspect is innocent. Thus, most of the criminals continue to be "non-criminals" legally. Only legal identification/conviction/punishment of the accused for his criminal act brings him to the epithet of a "criminal" in legal terms.

2.2.2 Identity of a Criminal

Identifying the criminals and linking them with crime are the major tasks in a criminal investigation. The following pieces of evidence help to identify the criminal:

1. Confession of a culprit that he/she committed the crime attributed to him/her.
2. The eyewitnesses who saw him/her committing the crime at the crime scene, identifying the culprit.
3. The victim identifying the culprit.
4. *Portrait Parle*, Artist's sketch, Identity Kit Sketch, or Photofit photograph built on the description given by the eyewitness help to identify the culprit.
5. Interrogation of the culprit (and the victim) through lie detector/narco-analysis/ brain profiling often help to identify the culprit.
6. Forensic biometrics help to identify a culprit.
7. Cells from human body parts is a deciding clue that helps in identifying the culprit, beyond reasonable doubt. The culprit can leave them at the scene, with the victim, on the discarded weapon of offence, on the route, or in the vehicle used in the commission of crime. It facilitates the identification of the culprit.
8. Evidentiary clues that the culprit picks up from the scene, from the victim, from the discarded weapon of offence or from the vehicle used in the commission of crime may indicate his identity.
9. Circumstantial evidence is potent mode leading to the identity of the criminal.
10. Acts of commission and omission and behaviour of the suspect after committing the crime may give out his identity.
11. Motive(s) is a powerful indicator of the complicity in the criminal act. They point the needle of suspicion towards the culprit.
12. The post-incident activities of the culprit (to hide the crime, to extricate himself, and to make unavailable) are potent indicator of the involvement of the person.
13. The recovery of valuables or other entities belonging to the victim are strong proofs of his complicity in the crime.

The investigating officer(s) interrogates the subjects, locates the clues, collects them, get them evaluated, and collates the total evidence to identify and link the suspect with the crime. He often procures experts' help in these processes.

Forensic Science assists the IO to identify the culprit and to link him with the crime.

2.2.3 Classification of Criminals

The classification of criminals is somewhat complicated. However, for general understanding the following types are considered:

1. **Violent Criminals:** They commit crime against a person. Sexual offenders, kidnappers, murderers, dacoits, robbers, religious fanatics, and terrorists are some types of violent criminals.
2. **Public Order Agitators:** They include terrorists, anarchist, revolutionaries, political agitators, *Coup d'état* promoters, and others trying to overthrow the government in power.
3. **Fraudsters:** Include a variety of con artists. Forgers, impersonators, cheats, chain business promoters, commercial and financial fraudsters, spurious substitute drug manufacturers, patent, and copyright violators.
4. **Narcotic drug** smugglers, peddlers, traders, and manufactures.
5. **Firearms** and ammunition smugglers.
6. **Narcotics traders** manufacturers/smugglers/stockiest/distributors/peddlers.
7. **Fake currency dealers** or prohibited currency dealers and spurious currency printers.
8. **Perjurers**: They are stock witnesses, persons who switch evidence and those who "pad" evidence to "strengthen cases".
9. **Juvenile Delinquents:** They are those criminals who have not acquired adulthood. They commit all sorts of crimes. Sex crimes, crime against property, rioting, and agitations are their favourite crimes. August 2011 riots, in London and other cities of England, were rather a revelation to the shape of things to come *via* juvenile delinquency.
10. **Cybercriminal:** A new class of criminals have emerged who carry out computer and cybercrimes.

Law deals with the delinquent juveniles rather leniently in the hope of bringing them back to normal stream of life.

The criminals are also classified on the basis of their entry into the criminal world. Thus we, have:

1. **Chance Criminal**

   The chance criminal is one who prior to the commission of the act had no intention to commit the crime**.** Accidental discharge of a gun, injuring, or killing someone makes the shooter a chance criminal. Likewise, in a road accident damage to the vehicle or injury to a person is not intentional. The person responsible for the accident is a chance criminal.

2. **Provoked Criminal**

   Here the crime is committed due to a sudden provocation. Prior to the occurrence the culprit had no intention to commit the crime. But sudden provocation, verbal, or through some action on the part of the victim brought in reaction in the form of the given crime.

3. **Pre-planner**

   The criminal in this category preplans the crime. Dacoities and kidnappings are the aftermath of proper planning. Most of the murders are also planned murders.

4. **Recidivist**

   A recidivist is a criminal who has been convicted once (or more times) and has again started committing the crime. It is believed that association with the hardened criminals in the jail promotes emergence of recidivists.

5. **Professional**

   A criminal is a professional if he has adopted crime as a profession. There are many types such as: Professional killers, arsonists, forgers, fraudsters, and burglars are some of them.

6. **Mentally Sick Criminals**

   Some criminals who commit a crime are mentally ill. Sex maniacs, serial killers, fanatic murderers, and kleptomaniacs are glaring examples of such criminals.

7. **Crime Syndicates**

   Organised crime syndicates are found in every country. A number of criminals combine forces and carry out criminal activity conjointly.

8. **Shady Go-getters**

   Bigwigs, politicians, bureaucrats, businesspersons, and especially the politicians are often the ones to decide big deals where stakes are high. The interested parties almost invariably offer fantastic amounts as grease money. Quattrocchi of Bofors infamy is a well-exposed notorious example.

9. **Religious fanatics**

   Religious fanatics who spread hate among the sections of different faith/religions/sects.

10. **Political fanatics**

    They are anarchists who spread chaos in a country.

11. **Money launderers**

    They are magicians. They churn "black money" and produce "white money". Safe transformation of black money is a major crime. They receive black money and change it to white money, on commission basis. They usually have foreign partners or local Hawala[6] people to accomplish the task.

    The increasing corruption in all businesses has increased the quantum of black money manifolds. Quattrocchi cooked up hundreds of crores of rupees as grease money in Bofors Gun case. It was thought to be a big amount, but it pales into insignificance when we are faced with the loot of thousands of crores of rupees in Common Wealth Games (2010), coal auctions, 2G Telecom scam, and other super *Ghotala* (fraud) games.

    The converted black money so obtained stands stashed in the offshore banks as white money.

6. Money launderers.

2.3 CRIMINAL INVESTIGATION

Why Investigate?

1. to find the truth about the occurrence
2. to identify the culprit/victim/witness
3. to guess/locate/dig/collect linking physical evidence
4. to link physical evidence with the culprit/victim/SOO/WOO/*modus operandi, inter se*
5. to interrogate the victim/culprit/witnesses to ascertain truth
6. to provide crime data to the expert (instrumental Interrogation) and to get disclosure statement
7. to coordinate the work/evidence of the various specialists/experts
8. to know the prosecution/defence/real version
9. to collect intelligence about the criminal/victims/their associates
10. to collate the total evidence to make the case a connected whole
11. to establish, *inter se,* consistency of the total evidence
12. to ensure sufficiency of evidence for proof "**beyond reasonable doubt**"
13. to file charge sheet under section 173 of CrPC with relevant documents

"Search with dedication; ye shall find"

Criminal investigation starts with the understanding of the nature of the crime and the psychology/motive of the criminal for effective results. The task is multifarious in most of the cases. The investigating officer often needs the assistance of a number of specialists, as he cannot carry out the work single-handed.

2.3.1 Laws and Rules

Criminal investigation functions as per the laws laid by the legislature (Parliament and the state legislatures). The laws need modifications at times. Parliament/legislatures enact the needed amendments.

The laws are codified to ensure uniformity in the dissemination of justice and to reduce the personal element in their interpretation.

There are three main Codes, which largely deal with criminal investigation and trials:

1. *The Criminal Procedure Code*, 1973. The Criminal Procedure Code became effective w.e.f. 1 April 1974. It has been amended from time to time to meet the current and on-coming needs.
2. *The Indian Penal Code*, 1860. The Indian Penal Code delineates the nature of the various offences and the punishments they attract. The offences have been grouped into various categories in the Code[7] to discuss the nature of the offences and their punishments logically. The Code has been amended from time to time.

7. See Chapters V to XXIII of the Indian Penal Code, 1860.
This book discusses most of the investigative aspects of crime that need scientific inputs. The discussions are concise, precise and hopefully comprehensive.

3. *The Indian Evidence Act*, 1872. The Indian Evidence Act defines and consolidates the law of evidence in India. Its jurisdiction is for all judicial proceedings before any court in India, excluding Jammu and Kashmir. It specifies the varied nature, the mode of production of the evidence in a civil or criminal case, and the value of the evidence produced by the prosecution for or against an accused.

Some controversial issues come up on some sections of the Codes, now and then. The Supreme Court and the High Courts interpret the correct position of the laws and its applications, in the form of case law, relating to the controversies that come up in the trials and give the correct interpretation of the involved law.

These three Codes help in the smooth functioning of the criminal justice system in India.

In addition, there is a plethora of Laws and Acts, which deal with specific law issues like the *Information Technology Act*, *Marriage Act*, *Money Laundering Act*, and the *Arms Act*. They are also amended from time to time to meet the emerging/changing needs of the society.

The superior courts oversee the laws in action to ensure that the functioning does not cross the constitutional limits.

2.3.2 Investigations

Once the existence of a crime is established, the assigned investigating officer (IO) starts investigations. Criminal investigation plays a pivotal role in criminal justice system to maintain law and order in a society. It helps to establish *corpus delicti.* It identifies the culprit/his associate/victims/witnesses. It finds evidence to link the criminal with the crime and ascertains the innocence of the innocent. It indicates the *modus operandi*, the motive, the weapon of offence, the nature of the vehicle used, the time of the incident, the disposal mode/sites of the incriminating entities, and valuables. It provides leads and the *modus operandi*.

Criminal investigation is simply collecting total evidence about a criminal act to find answers to many questions including the following:

1. Is the incident in question really a crime or a deceit?
2. Where is/was the *corpus delicti*?
3. Has the *corpus delicti* been identified beyond a reasonable doubt?
4. What is the motive behind crime?
5. Who are the victim(s)/culprit(s)/witness(s)?
6. Are the identities of the alleged criminals/victims genuine or false?
7. Where is the crime scene(s)?
8. Is the alleged scene real or phony?
9. When was the crime committed?
10. What is the evidence against the culprit: Physical/Oral/Circumstantial/Scientific?
11. What was the motive behind the crime?
12. Is the culprit really insane or professing insanity as defence?
13. What was the *modus operandi*? What are his routes of ingress/egress/point of entry? How did he enter the site?
14. Are the various pieces of evidence (physical clues/eyewitness accounts/circumstantial including scientific evidence, confession and statements of the culprit/approver) consistent *inter se*?

15. Is the time element of occurrence consistent with time of the other events involved in the crime?
16. Is the evidence involved in the case real or false?
17. Are the witness/victim/culprit telling the truth or perjuring?
18. Which are the hiding places of the culprit, valuables, *corpus delicti,* or evidence?
19. Who are the accomplices of the culprit?
20. What did the culprit(s) do after committing the crime?

Police is the main organisation to investigate a crime. Some persons employ private investigators also. The police and other investigators find answers to the above questions: establish *corpus delicti*, identify the culprit, locate, collect, preserve, evaluate (or get evaluated) evidentiary clues, and collate the total evidence: oral and circumstantial, including physical evidence to link or de-link a suspect with the crime beyond reasonable doubt.

The police investigators are police officers of varied statuses, appointed by the government. All of them have a common title, **I**nvestigating **O**fficers (**IO**). They use the departmental facilities including, computerised data, network of intelligence, which keeps them informed about the activities of the bad characters/criminals and their movement at material times. They also are kept in the loop of the prevailing criminal environment, the likely explosive situations and happenings, which can lead to crime.

2.3.3 The Investigator

Major tasks of the investigating officers in the investigation of a crime are to:

1. Provide medical assistance to the injured person(s).
2. Examine the scene of occurrence, guard it, document it, assess, and procure the needed help (expert or otherwise) for the examination of the scene.
3. Locate, collect, and preserve the evidentiary clues from the scene, and maintain their integrity, authenticity, and continuity of the chain of possession.
4. Ascertain the possible culprit(s) and arrest him immediately.
5. Detain the witnesses and interrogate them individually.
6. Detain the associates of the culprit/victim if they were present at the crime scene.
7. Get post-mortem of the deceased done.
8. Get the evidence evaluated from the specialists (Forensic Scientists!) concerned.
9. Collate the total evidence (oral evidence, circumstantial evidence, medico-legal evidence, forensic, and other expert evidence).
10. The task of an investigating officer is tough and taxing. He has to be:
    - Intelligent to anticipate/understand manipulation of the criminal and his *modus operandi.*
    - Physically fit and mentally alert, to guard against the sudden attack of criminals.
    - Know-all (*Hamadan*) person, to know investigation techniques, human psychology to understand the mental working and behaviour of the men involved.
    - Conversant with law, so that, during his investigations, he does not trespass the legal barriers or infringe human rights.

- He has to be a go-getter to get cooperation of the various individuals including that of the culprit(s) and his near and dear ones.

Fig. 2.1
IO finds answers to the above questions

In short, he has to be a superhuman with ideal attributes (given in the box below):

Ideal Attributes of an IO

1. Well-educated, trained, and experienced and should constantly update his knowledge.
2. Mentally and physically healthy
3. Emotionally stable and fearless
4. Intelligent: sound intuition and logical judgment
5. Public relations: co-operative and cooperation seeker/getter
6. Believer in teamwork
7. Motivated and dedicated
8. Persistent, objective
9. Keen observer
10. Person of high integrity
11. Possesses excellent communicative skill
12. Knows, respects, and believes in law of the land and works within the limits of law
13. Uses modern techniques for investigation and for handling men, materials, and situations
14. Knows (and uses) scientific methods of investigations and their potentialities/limitations
15. Understands human psychology: what ticks a person and what are the failings
16. Absolutely dependable/reliable
17. Able to take decisions

It is a tall order; but Central! Mandatory!!

2.3.4 The Crime Scene[8]

It is said that the success/failure of criminal investigations starts and ends at the crime scene. Handling a crime scene brooks no delay. The IO must use his subordinates to reach the scene of occurrence on receipt of information that a crime has been committed in his jurisdiction. He may send his deputy if he himself is entangled in some other case. On arrival, the first police officer takes care of the injured, guards the scene, preserves the transient evidence, assesses the processing needs of the scene, and informs the superiors.

The IO takes over from the first police officer as soon as possible and handles the situations after prioritisation of various tasks.

The systematic handling of the crime scene situation is discussed, in detail, elsewhere.[9]

2.3.5 People Involved

The men involved in a crime are the criminal(s), the victim(s), the witnesses, and the on-lookers at the scene. The first police officer at the scene expels all the onlookers from the scene. He arrests the identified and available culprit(s). He segregates the witnesses, and the culprits; and later, after processing the crime scene, interrogates all the persons thoroughly who know something about the crime.

Forensic Psychologists assist the IO in the interrogations.[10]

Various types of scientific experts are helping the investigator in his/her investigational activities increasingly. In fact, a societal sea change is making the scientific methods of investigations indispensable. They are not costly in terms of the total cost of the investigation and trials. Governments are encouraging the changeover because non-scientific investigations are increasingly bringing in investigative failures and hence, the public wrath. The following forensic specialists help:

1. **Crime Scene photographer and videographer:** He documents/records the scene and makes it mobile. Even the judge can ”visit“ the scene in the courtroom. He records the nature and position of the evidence also, which can help to reconstruct the crime correctly.
2. **Medico-legal Expert:** He deals with the dead and the injured. He ascertains death, the cause of death, the time of death, and a lot of other relevant information especially about the identity of the victim and personality of the culprit. His report is a great help in the reconstruction of the events of the occurrence.

   He also collects evidence and evidentiary clues from the dead/injured persons.
3. **Forensic Specialist**: He is an all-rounder expert. He is indispensable and should be associated with most of the criminal investigations, whenever possible.
4. **Miscellaneous Experts:** Other experts who help the criminal investigation are Fingerprint Experts, Explosives Experts, Arson Investigator, Civil/Mechanical Engineers, and the like.

8. For details See Chapter 5.
9. *Ibid.*
10. See Chapter 30 on “Forensic Psychology”.

In short, forensic science has travelled a long journey. It is now capable to assist criminal investigation in a big way. It helps to:

1. Establish *corpus delicti*.
2. Interrogate suspects, victims, and even witnesses to get at the truth. Hypnosis, Psychological Detection of Deception (lie detection), Narco-analysis, and Brain-Printing have revolutionised police interrogation by saving time, money and effort, and providing far superior results. The scientific methods used in interrogation have made the interrogation humane and legal, and have created possibilities for eliminating the notorious III–degree methods; which sometimes recoil and proved disastrous.
3. Fix the identity of a culprit/victim/witness beyond a reasonable doubt. Fingerprints have been serving criminal investigation for more than a century now for definite identity of the subject. However, DNA profiling has brought the real revolution in the last three decades. The identity of any person can be fixed from the tiniest body material, even from a single hair shaft or root. The culprit is bound to leave his body material almost invariably, at the scene. Rapists, even in a gang rape, can be identified individually without mistake!
4. Link the culprit with the victim, scene, weapon of offence, and vehicle used in the crime.
5. Reconstruct the sequence of events.
6. Verify prosecution/defence versions.
7. Inter-link serial crimes.
8. Provide leads to the criminal.
9. Indicate the sources/locations of evidence.
10. Delink the innocent accused from the crime.

Scientific criminal investigation has arrived indeed. Forensic science facilitates its task in its varied facets, plays a pivotal role in maintaining law and order, and preventing crime.

In short, criminal investigations and forensic science have become inseparable partners and can never be parted.

Supreme Court Guidelines on Investigation[11]

(i) Proceed to the spot (immediately);

(ii) Ascertain the facts/circumstances of the case;

(iii) Discover/arrest of the suspected offender;

(iv) Collect evidence relating to the offence, which may consist of:

- **(a) the examination of various persons (including the accused) and recording their statements,**
- **(b) the search of places /seizure of objects considered necessary for the investigation/production at the trial;**

(v) Formation of the opinion as to whether the material collected makes a case to place the accused for trial. If so, taking necessary steps for the same; by

(vi) Filing of a charge sheet under section 173 CrPC before the competent court.

11. *HN Rishbud v State of Delhi*, AIR 1955 SC 196 : 1955 (1) SCR 1150.

2.4 CRIMINAL JUSTICE SYSTEM

Every organised society has a system to prevent breach of law, to enforce laws, to handle lawbreakers, and assuage the victims so that the individual and the society has confidence in its criminal justice system that it will protect them and punish the culprit. Further, the system is bound (Constitution) to bring the criminals on the right path through psychological treatment, education, and job therapy. Only then, the society or the country can function smoothly and its members or citizens live without fear and work peacefully. The management of crime, framing of laws, law enforcement, and handling the aftermath of the law enforcement processes is collectively criminal justice system. The main aim of an efficient criminal justice system is "to enforce the specified standards of conduct, rules and laws" by:

1. Reducing crime
2. Ensuring real justice in a criminal case, to all, including the culprit and the victim
3. Dispensing exemplary punishment to the criminal, so that it acts as a deterrent to all criminals and fence sitters
4. Assuaging the victim or his kith and kin. They must feel that justice is done.
5. Providing him needed protection from the criminal and financial assistance and other help.
6. Creating confidence among the public that the system works and it would protect them

The criminal justice system generally has the following wings:

2.4.1 The Legislature

It frames laws.

2.4.2 The Investigation Agencies

The police and other law enforcement agencies detect crime, investigate crime, and find proof to link the crime with the criminal and prevent crime.

2.4.3 The Prosecution Agencies

Once the criminal investigations are complete, the IO submits the total evidence to the prosecution branch through a challan. Public prosecutor, a government advocate, of a specified court(s) represents the prosecution. The Public Prosecutors are also known as district assistant/district attorneys. They appraise the evidence. If they find some lacunae, they ask the IO to remove them. They process the trials and ensure that:

- The located, collected, preserved, evaluated, and presented evidence is relevant, authentic and its integrity and its identity are beyond reasonable doubt.
- The evidence produced is legally sound.
- The total evidence is adequate to prove the case beyond reasonable doubt
- The total evidence (the eyewitnesses' accounts, the circumstantial evidence, the medico-legal evidence, and the evidence of the experts) is consistent, *inter se*.

- The total evidence is adequate to prove the linkage of the criminal with the victim, the scene, and the weapon of offence beyond a reasonable doubt.
- The presentation is adequate, orderly and intelligible. The submission is well-illustrated, fortified by data **and** presented in simple, precise, and concise language and leads to only one conclusion that is given the report.
- The total evidence produced brings out "the truth, the whole truth and nothing but the truth".
- The total evidence leads to one and only one conclusion, that of the prosecution
- They specify the law infringed and present evidence to prove the guilt of the accused/suspect/criminal in the court.
- The evidence is logical and convincing.

2.4.4 Defence

The accused person has the right to defend himself. He can engage an advocate to defend him. If he cannot afford the advocate's fee, the court appoints Amicus Curiae (lawyer) to defend him.

A defence counsel guards the interest of the accused. He tries to find the real or imaginary lacunae in the evidences to obstruct/prevent the court to accept the prosecution evidence.

2.4.5 Court

It adjudicates, appraise the appropriateness of the law *vis-à-vis* the crime, the adequacy, and correctness of the evidence produced and the demeanour/performance of the witnesses. The judge bases his verdict on the proof submitted by the prosecution or the defence. The evidence should prove the thesis beyond a reasonable doubt.

The judge is legally qualified and trained in adjudication. He tries the accused of the alleged offence as per specified law.

There is a regular hierarchy of the Judges. It is:

1. Judicial Magistrates,
2. Chief Judicial Magistrates,
3. Sessions Judges,
4. High Court Judges, and
5. Supreme Court Judges.

There are sometimes special courts to do judicial work. They are created for specific purpose. Lokpal and lokayukt (who examine cases against politicians and bureaucrats) and military courts (Courts Martial) which try military offenders.

There are still other courts but they do not handle criminal cases. They are special courts handling only specifically assigned category of cases. Thus, we have various types of tribunals: Administrative Tribunal, Tax Tribunal, Debt Recovery Tribunal, and so on. Even panchayats[12] carry out certain judicial functions.

12. Elected members from village(s) constitute a Panchayat, which has been empowered by law to adjudicate minor cases of the area they represent.

The judges ascertain the validity of the charges and adjudicate whether the evidence produced against the accused is truthful, legal, properly presented, and sufficient to prove the alleged guilt beyond reasonable doubt so that no innocent person suffers though a culprit may get acquittal — on benefit of doubt or otherwise. The judges often adhere to the *dictum*:

100 culprits may escape punishment but one innocent person must not get punished.

The judge is assisted by government and defence counsels to record and assess the evidence. He may also request expert help when he feels that there is need for the same.

The judges critically appraise the total evidence produced, both by the prosecution and the defence. In short, he ensures that adequate evidence is tendered which prove the charge framed against the accused. The judge then convicts/punishes him in accordance with the law, court conventions, and judicial precedents.

2.4.6 Prisons, Reformatories

Convicted persons are punished. The highest punishment is death sentence. However, it is awarded in the rarest of the rare cases. Usually the convict undergoes imprisonment for various periods, with or without fines, depending upon the nature of a crime. In some cases, only fine meets the ends of justice.

Juvenile criminals are punished leniently. They are often sent to reformatories or correctional homes. They are also kept under watch.

The prisons, reformatories, and juvenile houses are the places where the convicts with prison sentence are kept. The prison authorities handle the convicts during their conviction period. The government has introduced many programmes to make the prisoners good citizens and to bring them back to the society as normal citizens.

Punishment to the criminals is mainly intended to deter criminals, to prevent recidivism, to induct restitution, to assuage the victim or his or her kith and kin, and to reform the criminal. Many institutions cater to the punishment process. Jails, juvenile homes, reformatories, restricted movements, and periodic reporting to the police are well-known institutions to achieve the end. Psychologists, religious mentors and Yoga Gurus provide the new approaches to cure the criminal of the criminal behaviour under the concept that crime is a disease. Work therapy is used extensively to change the behaviour of the criminals. Forensic Psychology[13] is being used increasingly to handle the punishment aspects of the system to achieve maximum societal benefit with minimal harm to the culprit, the victim and the society.

2.4.7 Media

The media has no legal role in the criminal justice system. However, in recent years it is exercising tremendous influence on criminal trials. They often influence the verdict; earning the epitaph for the influence:

"Trial by Media" or "Media Trial"

Often, the moneybags and the influential bigwigs are able to hoodwink the law by buying the witnesses, by destroying (or replacing) the evidentiary clues, and sometimes even by bribing the judge. Media often jumps into the arena in important cases and influence the court decision, usually leading to correct verdict.

13. See Forensic Psychology, Chapter 30.

2.5 SUPREME COURT CASES — 21ST CENTURY

2.5.1 Conviction for murder on Circumstantial Evidence alone[14]

Author's Summary

It is a case of murder. The culprit brought a female with him to Delhi, stayed in a hotel, killed her and left her body in the hotel and vanished from the scene. There were no eyewitnesses to this heinous crime at Delhi. He was convicted on circumstantial evidence. Supreme Court maintained the conviction. It did not accept the defence objection to such conviction. Supreme Court also laid the following law, with support from other similar cases:

1. **"the Courts will be well-advised in case of circumstantial evidence to be watchful and to ensure that conjectures and suspicions do not take place of legal proof.**
2. **"it is well-settled that those circumstances must be proved to be such as to be conclusive of the guilt of the accused and incapable of explanation on any hypothesis consistent with the innocence of the accused.**
3. **"Modern thinking is in favour of the view that proof beyond a reasonable doubt is the same as proof which affords moral certainty to the Judge."**

Highlights italicised

2.5.2 Relevant Extracts (Verbatim)

The learned Senior Advocate, Mr. Jaspal Singh, has been able to state the proposition of law with due clarity. It has been contended that in the event of there being only circumstantial evidence, it is well-settled that those circumstances must be proved to be such as to be conclusive of the guilt of the accused and incapable of explanation on any hypothesis consistent with the innocence of the accused. It has been contended further that it is on this score the law seems to be well-settled as well, to writ that the Courts will be well-advised in case of circumstantial evidence to be watchful and to censure that conjectures and suspicions do not take place of legal proof. It has been the appellant's contention that the prosecution has utterly failed to link up the chain and as a matter of fact the snap in the chain is not very far to seek, thus warranting an order of acquittal and the High Court has fallen into a manifest error in regard thereto. The evidence of PW-1 and PW-23 being Madan Singh and Dinesh Chand was taken recourse to. It is on this score, it has been contended that (a) None of them has identified the appellant; (b) None of them has stated the it was the appellant who had checked in on 18-9-1991; (c) None of them has stated that it was the appellant who had checked out on 19-9-1991 at 8.30 a.m.; and (d) Rather both the witnesses have stated that appellant was not the person who had checked in on 18-9-1991 or who had checked-out in on 18-9-1991 at 8.30 a.m. and drawing inspiration therefrom, Mr. Singh in support of the appeal contended that there is thus no direct evidence available to prove that it was the appellant who had checked in on 18th September, 1991 or had left the hotel on 19th September, 1991. Admittedly, there is no difficulty in appreciating the submissions of Mr. Singh. Availability of direct evidence is not there but what about the circumstances? Before doing so, be it noted that the evidence of PW-6, Sahmim Bano as to the date of departure of the accused with his wife Hazra *alias* Halima from Bombay to Delhi and the subsequent telephonic message that Halima died in

14. *State of Madhya Pradesh v Sanjay Rai,* AIR 2004 SC 2174 : 2004 AIR SCW 1919 : 2004 Cr LJ 2006 (SC).

a bus accident and that cremation has taken place in Nizamuddin stand out to be a rather significant component of the chain of evidence.

(a) The appellant came to visit Delhi along with his wife Hazra *alias* Halima leaving Bombay on 17th September, 1991.

(b) On 18th September, 1991 at about 8.50 p.m. both of them claimed to be husband and wife. Alamgir, appellant entered his name and address in the guest register and received key of Room No. 107 and stayed in Room No. 107 in Royal Inn Guest House, Netaji Subhash Marg, Daryaganj, Delhi.

(c) On 19th September, 1991 in the morning at 8.30 a.m., Alamgir left the guest house locking his wife in the room and did not return thereafter.

(d) The appellant telephonically informed PW-6, Shamim Bano that the deceased died in a bus accident and was buried in Nizamuddin and thereafter the appellant left Delhi for Bombay.

(e) The appellant's wife was found dead due to strangulation in Room No. 107 on opening of the same with duplicate key on 20th September, 1991.

(f) The appellant was arrested at Bombay on 21st September, 1991 and key of the room was recovered from him along with ticket from Delhi to Bombay dated 19th September, 1991 proving that he after killing his wife instead of taking her care, had left for Bombay on 19th September, 1991. Only beyond the range of a reasonable doubt, of course, the expression 'reasonable doubt' is incapable of definition. Modern thinking is in favour of the view that proof beyond a reasonable doubt is the same as proof which affords moral certainty to the judge.

The question for consideration is thus as to whether the circumstances noticed above would form a complete chain of events without any snap and pointedly point to the accused as the guilty person and to no-one else. In the event there is an answer in the affirmative, question of interference with the order of the High Court would not arise. Incidentally, the High Court did emphasize on the true and correct meaning of the phraseology 'reasonable doubt' to be attributed thereon and it is on this score, the High Court records:

> *Modern thinking is in favour of the view that proof beyond a reasonable doubt is the same as proof which affords moral certainty to the Judge.*

We are, however, not expressing any opinion with regard thereto. Suffice it to say that sufficiency of moral certainty itself is a matter for deliberation and since the matter has not been addressed to us on that score, expression of opinion on the same would not arise.

The circumstances noticed above, if read with the evidence of PW-6, Shamim Bano as to the date of departure of the accused with his wife Hazra *alias* Halima from Bombay to Delhi and the telephonic message after two days that Halima had died in a bus accident and that she had been cremated at a cremation ground in Nizamuddin – this piece of evidence, as noticed above, if read along with the circumstances noticed above, would form a chain without there being any snap. Strenuous submissions have been made as regards the admissibility of the Handwriting Expert's opinion as also a challenge thrown to the non-admissibility of the entire evidence of Shamim Bano, PW-6. This evidence of Shamim Bano has been challenged on two counts: on the first Shamim Bano, being the sister of Halima, was an interested witness and secondly, she did not say so in a statement before the police under section 161, Cr. P.C. Interested witness by itself cannot

possibly be a ground to reject the evidence on record. The test of creditworthiness or acceptability, in our view, ought to be the guiding factor and if so, question of raising an eyebrow on the reliability of witness being an interested witness would be futile in the event of the evidence being otherwise acceptable, there ought not to be any hindrance in the matter of prosecutor's success. The evidence must inspire confidence and in the event of unshaken credibility, there is no justifiable reason to reject the same. It is on this score the issue of interested witness thus stands negated, as raised by the appellant. The second limb pertains to the statement under section 161, Cr. P.C. Admittedly, the piece of evidence was not available in the statement of the witness under section 161, Cr. P.C., but does it take away the nature and character of the evidence in the event there is some omission on the part of the police official. Would that be taken recourse to as amounting to rejection of an otherwise creditworthy and acceptable evidence—the answer, in our view, cannot but be in the negative. In that view of the matter, the evidence of PW-6 thus ought to be treated as creditworthy and acceptable and it is to be seen the effect of such an acceptability.

Similarly, however, the opinion of this court in *Pawan Kumar v State of Haryana*,[15] in which one of them (UC Banerjee J), was a party. The opinion of the court runs as under:

Incidentally, success of the prosecution on the basis of circumstantial evidence will, however, depend on the availability of a complete chain of events so as not to leave any doubt for the conclusion that the act must have been done by the accused person. While, however, it is true that there should be no missing links, in the chain of events so far as the prosecution is concerned, but it is not that every one of the links must appear on the surface of the evidence, since some of these links may only be inferred from the proven facts. Circumstances of strong suspicion without, however, any conclusive evidence are not sufficient to justify the conviction and it is on this score that great care must be taken in evaluating the circumstantial evidence. In any event, on the availability of two inferences, the one in favour of the accused must be accepted and the law is well-settled on this score, as such we need not dilate much in that regard excepting, however, noting the observations of this Court in the case of *State of Uttar Pradesh v Ashok Kumar Srivastava*, AIR 1992 SC 840 : 1992 AIR SCW 640 : 1992 Cr LJ 1104, wherein this Court in paragraph 9 of the report observed:—

This Court has, time out of number, observed that while appreciating circumstantial evidence the Court must adopt a very cautious approach and should record a conviction only if all the links in the chain are complete pointing to the guilt of the accused and every hypothesis of innocence is capable of being negatived on evidence. Great care must be taken in evaluating circumstantial evidence and if the evidence relied on is reasonably capable of two inferences, the one in favour of the accused must be accepted. The circumstance relied upon must be found to have been fully established and the cumulative effect of all the facts so established must be consistent only with the hypothesis of guilt. But this is not to say that the prosecution must meet any and every hypothesis put forward by the accused, however, far-fetched and fanciful it might be. Nor does it mean that prosecution evidence must be rejected on the slightest doubt because the law permits rejection if the doubt is reasonable and not otherwise.

The other aspect of the issue is that the evidence on record, ascribed to be circumstantial, ought to justify the inferences of the guilt from the incriminating facts and circumstances which are incompatible with the innocence of the accused or guilt of any other person. The observations of this Court in the case of *Balwinder Singh v State of Punjab*, AIR 1987 SC 350 : 1987 Cr LJ 330 : (1987) 1 SCC 1 lends concurrence to the above.

In a more recent decision of this Court in *Sudama Pandey v State of Bihar*, (2002) 1 SCC 679, the law as noticed above and to the same effect stands very felicitously expressed.

15. *Pawan Kumar v State of Haryana,* AIR 2001 SC 1324 : AIR 2001 SCW 1111 : (2001) 3 SCC 628.

There is no doubt that conviction can be based solely on circumstantial evidence but it should be tested by the touch-stone of law relating to circumstantial evidence laid down by this Court as far back as in 1952.

In *Hanumant Govind Nargundkar v State of Madhya Pradesh*, AIR 1952 SC 343 : 1952 SCJ 509 : 1952 SCR 1091, it was observed thus:

It is well to remember that in cases where the evidence is of a circumstantial nature, the circumstances from which the conclusion of guilt is to be drawn should in the first instance be fully established and all the facts so established should be consistent only with the hypothesis of the guilt of the accused. Again, the circumstances should be of a conclusive nature and tendency and they should be such as to exclude every hypothesis but the one proposed to be proved. In other words, there must be a chain of evidence so far complete as not to leave any reasonable ground for a conclusion consistent with the innocence of the accused and it must be such as to show that within all human probability the act must have been done by the accused.

A reference may be made to a later decision in *Sharad Birdhichand Sarda v State of Maharashtra*, AIR 1984 SC 1622 : (1984) 4 SCC 116 : 1984 Cr LJ 1738. Therein, while dealing with circumstantial evidence, it has been held that onus was on the prosecution to prove that the chain is complete and the infirmity of lacuna in prosecution cannot be cured by false defence or plea.

The conditions precedent in the words of this Court, before conviction could be based on circumstantial evidence, must be fully established. They are:

(1) the circumstances from which the conclusion of guilt is to be drawn should be fully established. The circumstances concerned 'must' or 'should' and not 'may be' established;

(2) the facts so established should be consistent only with the hypothesis of the guilt of the accused, that is to say, they should not be explainable on any other hypothesis except that the accused is guilty;

(3) the circumstances should be of a conclusive nature and tendency;

(4) they should exclude every possible hypothesis except the one to be proved; and

(5) there must be a chain of evidence so complete as not to leave any reasonable ground for the conclusion consistent with the innocence of the accused and must show that in all human probability the act must have been done by the accused.

These aspects were recently highlighted in *State of Rajasthan v Rajaram*, AIR 2003 SC 3601 : 2003 AIR SCW 4097 : 2003 Cr LJ 3901.

There is no doubt that conviction can be based solely on circumstantial evidence but it should be tested by the touchstone of law relating to circumstantial evidence laid down by this Court as far back as in 1952.

2.5.3 Dereliction in Investigation[16]

Author's Summary

It is a case of murder. Three persons attacked and killed their neighbour with *lathis*. The police and the medico-legal expert did not do the investigation properly. The court passed strictures against them and asked the government to take action against them. The ire of the court is indicated in italics (by the author) of the relevant text.

Highlights italicised

16. *Dayal Singh v State of Uttaranchal,* AIR 2012 SC 3046 : (2012) 8 SCC 263 : 2012 Cr LJ 4323. [DOJ 3 August 2012].

2.5.4 Relevant Extract (Verbatim)

The facts giving rise to the questions in the present appeal are that the fields of Gurumukh Singh and Dayal Singh were adjoining in the village Salwati within the limits of Police Station Sittarganj, district Udham Singh Nagar. These fields were separated by a mend (boundary mound). On 8 December 1985 Gurumukh Singh, the complainant, who was examined as PW-2, along with his father Pyara Singh, had gone to their fields. At about 12 noon, Smt. Balwant Kaur, PW-4, wife of Pyara Singh came to the fields to give meals to Pyara Singh and their son Gurumukh Singh. At about 12.45 p.m, the accused persons, namely, Dayal Singh, Budh Singh & Resham Singh (both sons of Dayal Singh) and Pahalwan Singh came to the fields wielding lathis and started hurling abuses. They asked Pyara Singh and Gurumukh Singh as to why they were placing earth on their mend, upon which they answered that mend was a joint property belonging to both the parties. Without any provocation, all the accused persons started attacking Pyara Singh with lathis. Gurumukh Singh, PW-2, at that time, was at a little distance from his father and Smt. Balwant Kaur, PW-4, was nearby. On seeing the occurrence, they raised an alarm and went to rescue Pyara Singh. The accused, however, inflicted lathi injuries on both PW-2 and PW-4. In the meanwhile, Satnam Singh, who was ploughing his fields, which were quite close to the fields of the parties and Uttam Singh (PW-5) who was coming to his village from another village, saw the occurrence. These two persons even challenged the accused persons upon which the accused persons ran away from the place of occurrence. Pyara Singh, who had been attacked by all the accused persons with lathis fell down and succumbed to his injuries on the spot. Few villagers also came to the spot.

According to the prosecution, pagri (Ex. 1) of one of the accused, Budh Singh, had fallen on the spot which was subsequently taken into custody by the Police. Gurumukh Singh, PW-2, left the dead body of his deceased father in the custody of the villagers and went to the police station where he got the report, Exhibit Ka-3, scribed by Kashmir Singh in relation to the occurrence. The report was lodged at about 2.15 p.m. on 8 December 1985 by PW-2 in presence of SI Kartar Singh, PW-6. FIR (Exhibit Ka-4A) was registered and the investigating machinery was put into motion. The two injured witnesses, namely, PW-2 and PW-4 were examined by Dr. P.C. Pande, PW 1, the medical officer at the Public Health Centre, Sittarganj on the date of occurrence.

At 4.00 p.m., the doctor examined PW-2 and noticed the following injuries on the person of the injured witness *vide* Injury Report, Ex. Ka-1.

1. Lacerated wound of 5 cm X 1 cm and 1 cm in depth. Margins were lacerated. Red fresh blood was present over wound. Wound was caused by hard and blunt object. Wound was at the junction of left parietal and occipital bone 7 cm from upper part of left ear caused by blunt object. Advised X-ray. Skull A.P. and lateral and the injury was kept under observation.
2. Contusion of 6 cm X 2.5 cm on left side of body 3 cm above the left iliac crest. Simple in nature caused by hard and blunt object.

According to the doctor, the injuries were caused by hard and blunt object and they were fresh in duration.

On 8 December 1985 at 7.30 p.m. Dr. P.C. Pande (PW-1) examined the injuries of Smt. Balwant Kaur PW-4 and found the following injuries on her person *vide* injury report Ex. Ka. 2:

1. Contusion 6 cm X 3 cm on left shoulder caused by hard and blunt object.
2. Contusion of 5 cm X 2 cm on lateral side of middle of left upper arm. Bluish red in colour caused by hard and blunt object.

3. Contusion of 4 cm X 2 cm on left parietal bone 6 cm from left ear caused by hard and blunt object.

According to Dr. Pande, these injuries were caused by hard and blunt object and the duration was within 12 hours and the nature of the injuries was simple. According to Dr. Pande the injuries of both these injured persons could have been received on 8 December 1985 at 12.45 p.m. by lathi."

As noted above, according to Dr. Pande, the injuries were caused by a hard and blunt object and duration was within 12 hours. Thereafter, SI Kartar Singh, PW-6, proceeded to the place of occurrence in village Salwati. He found the dead body of Pyara Singh lying in the fields. In the presence of panchas, including Balwant Singh, PW-8, he noticed that there were three injuries on the person of the deceased, Pyara Singh and prepared Inquest Report *vide* Ex. Ka-6 recording his opinion that the deceased died on account of the injuries found on his body. After preparing the site plan, Ext. Ka-10, he also wrote a letter to the superintendent, Civil Hospital, Haldwani for post-mortem, being Exhibit Ka-9. The dead body was taken to the said hospital by Constable Chandrapal Singh, PW-7. Dr. C.N. Tewari, PW-3, medical officer in the Civil Hospital, Haldwani, performed the post-mortem upon the body of the deceased and did not find any ante-mortem or post-mortem injuries on the dead body. On internal examination, he did not find any injuries and could not ascertain the cause of death. Further, he preserved the viscera and gave the post-mortem report, Exhibit Ka-4. After noticing that there was no injury or abnormality found upon external and internal examination of the dead body, the doctor in his report recorded as under:

> Viscera in sealed jars handed over to the accompanying constables.
>
> Jar No. 1 sample preservative saline water.
>
> Jar No. 2 Pieces of stomach
>
> Jar No. 3 Pieces of liver, spleen and kidney.
>
> Death occurred about one day back. Cause of death could not be ascertained. Hence, viscera preserved.

It appears from the record that the deceased's viscera, which allegedly was handed over by doctor to the police, was either never sent to the Forensic Science Laboratory (for short, the 'FSL') for chemical examination, or if sent, the report thereof was neither called for nor proved before the Court. In fact, this has been left to the imagination of the Court. Considering the ocular and other evidence produced by the prosecution, the learned trial court *vide* its judgment of conviction and order of sentence, both dated 29th June, 1990, found the accused persons guilty of offences under section 302 read with section 34 IPC as well as under section 323 read with section 34 IPC. The trial court, while dealing with the arguments of the accused for application of section 34, as well as the submission that the witnesses had not attributed specific role to the respective accused persons, held as under:

"The attack was premeditated and the accused had come fully prepared to do the overt act. The injury was caused on the head of the deceased which is a vital part of the body at which it was aimed by employing lathi, it was clear that the accused persons had intended to cause death by giving blow on vital part of the body of the deceased. After receiving the injuries, the deceased fell down and even thereafter he was attacked by the accused persons and he died on the spot immediately.

Now, we will deal with the question of defective or improper investigation resulting from the acts of omission and/or commission, deliberate or otherwise, of the Investigating Officer or other material Witnesses, who are obliged to perform certain duties in discharge of their functions and then to examine its effects. In order to examine this aspect in conformity with the rule of law and keeping in mind the basic principles of criminal jurisprudence, and the questions framed by us at the very outset of this judgment, the following points need consideration:

(i) Whether there have been acts of omission and commission which have resulted in improper or defective investigation.

(ii) Whether such default and/or acts of omission and commission have adversely affected the case of the prosecution.

(iii) Whether such default and acts were deliberate, unintentional or resulted from unavoidable circumstances of a given case.

(iv) If the dereliction of duty and omission to perform was deliberate, then is it obligatory upon the court to pass appropriate directions including directions in regard to taking of penal or other civil action against such officer/witness.

In order to answer these determinative parameters, the Courts would have to examine the prosecution evidence in its entirety, especially when a specific reference to the effective or irresponsible investigation is noticed in light of the facts and circumstances of a given case.

The Investigating Officer, as well as the doctor who are dealing with the investigation of a criminal case, are obliged to act in accordance with the police manual and the known canons of medical practice, respectively. They are both obliged to be diligent, truthful and fair in their approach and investigation. A default or breach of duty, intentionally or otherwise, can sometimes prove fatal to the case of the prosecution. An Investigating Officer is completely responsible and answerable for the manner and methodology adopted in completing his investigation. Where the default and omission is so flagrant that it speaks volumes of a deliberate act or such irresponsible attitude of investigation, no court can afford to overlook it, whether it did or did not cause prejudice to the case of the prosecution. It is possible that despite such default/omission, the prosecution may still prove its case beyond reasonable doubt and the court can so return its finding. But, at the same time, the default and omission would have a reasonable chance of defeating the case of the prosecution in some events and the guilty could go scot-free. We may illustrate such kind of investigation with an example where a huge recovery of opium or poppy husk is made from a vehicle and the Investigating Officer does not even investigate or make an attempt to find out as to who is the registered owner of the vehicle and whether such owner was involved in the commission of the crime or not. Instead, he merely apprehends a cleaner and projects him as the principal offender without even reference to the registered owner. Apparently, it would *prima facie* be difficult to believe that a cleaner of a truck would have the capacity to buy and be the owner, in possession of such a huge quantity, *i.e.,* hundreds of bags, of poppy husk. The investigation projects the poor cleaner as the principal offender in the case without even reference to the registered owner.

Even the present case is a glaring example of irresponsible investigation. It, in fact, smacks of intentional mischief to misdirect the investigation as well as to withhold material evidence from the Court. It cannot be considered a case of *bona fide* or unintentional omission or commission. It is not a case of faulty investigation simpliciter but is an investigation coloured with motivation or an attempt to ensure that the suspect can go scot-free. This can safely be gathered from the following:

(a) The entire investigation, including the statement of the investigating officer, does not show as to what happened to the viscera which was, as per the statement of PW 3, handed over to the Constable, PW-7, who, in turn, stated that the viscera had been deposited in the Police Station Malkhana. In the entire statement of the Investigating Officer, there is no reference to viscera, its collection from the hospital, its deposit in the Malkhana and whether it was sent to the FSL at all or not. If sent, what was the result and, if not, why?

(b) Conduct of the Investigating Officer is more than doubtful in the present case. In his statement, he had stated that he noticed three injuries on the body of the deceased. He also admitted that in the post-mortem report, no internal or external injuries were shown on the body of the deceased. According to him, he had asked PW-3 in that regard but the reply of the doctor was received late and the explanation rendered was satisfactory. Firstly, this reply or explanation does not find place on record. There is no document to that effect and secondly, even in his oral evidence, he does not say as to what the explanation was.

(c) In his statement, PW-3, Dr. C.N. Tewari, stated that he did not find any external or internal injuries even after performing the post-mortem on the body of the deceased. This remark on the post-mortem report apparently is falsified both by the eyewitnesses as well as the Investigating Officer. It will be beyond apprehension as to how a healthy person could die, if there were no injuries on his body and when, admittedly, it was not a case of cardiac arrest or death by poison etc., more so, when he was alleged to have been assaulted with dandas (lathi) by four persons simultaneously. In any case, the doctor gave no cause for death of the deceased and prepared a post-mortem repor, which ex facie was incorrect and tantamount to abrogation of duty. The trial court while giving the judgment of conviction, noticed that medico-legal post-mortem examination is a very important part of the prosecution evidence and, therefore, it is necessary that it be conducted by a doctor fully competent and experienced. The Court also commented adversely upon the professional capabilities and/or misconduct of Dr. C.N. Tewari, as follows:

> ***"Whatever may have been the reasons but it is quite evident that Dr. C.N. Tewari failed in his professional duty and he did not perform post-mortem examination properly after considering the inquest report and the police papers sent to him. If his finding differed from the finding of the Panchas he should have informed his superior officers in that regard so that another opinion could have been obtained before the disposal of the dead body. The evidence leaves no room for doubt that Sri Pyara Singh was attacked with lathis as alleged by the prosecution and he received three injuries already referred to above which were mentioned in the inquest report (Ex. Ka-6)...***
>
> ***The case of the prosecution cannot be thrown on account of the gross negligence and apathy of the Medical Officer Dr. C.N. Tewari who had performed autopsy on the dead body of Sri Pyara Singh. Since the Medical Officer Dr. C.N. Tewari had conducted in a manner not befitting the medical profession and prepared post-mortem report against facts for reasons best known to him and was negligent in his duty in ascertaining the injuries on the body of the deceased, hence it is just and proper that the Director-General, Medical Health U.P. be informed in this regard for taking necessary action and for eradicating such practices in future."***

2.5.5 Duties of the Court

Now, we may advert to the duty of the Court in such cases. In the case of *Sathi Prasad v State of Uttar Pradesh*, (1972) 3 SCC 613 : AIR 1973 SC 448 : 1973 Cr LJ 344

> *This Court stated that it is well-settled that if the police records become suspect and investigation perfunctory, it becomes the duty of the Court to see if the evidence given in Court should be relied upon and such lapses ignored. Noticing the possibility of investigation being designedly defective, this Court in the case of Dhanaj Singh @ Shera v State of Punjab, (2004) 3 SCC 654 : AIR 2004 SC 1920 : 2004 AIR SCW 1609, held, "in the case of a defective investigation the Court has to be circumspect in evaluating the evidence. But it would not be right in acquitting an accused person solely on account of the defect; to do so would tantamount to playing into the hands of the investigating officer if the investigation is designedly defective."*

23. Dealing with the cases of omission and commission, the Court in the case of *Paras Yadav v State of Bihar*, AIR 1999 SC 644 : 1999 AIR SCW 296 : 1999 Cr LJ 1122, enunciated the principle, in conformity with the previous judgments, that

> *If the lapse or omission is committed by the investigating agency, negligently or otherwise, the prosecution evidence is required to be examined de hors such omissions to find out whether the said evidence is reliable or not. The contaminated conduct of officials should not stand in the way of evaluating the evidence by the courts, otherwise the designed mischief would be perpetuated and justice would be denied to the complainant party.*

In the case of *Zahira Habibullah Sheikh v State of Gujarat*, (2006) 3 SCC 374 : AIR 2006 SC 1367 : 2006 AIR SCW 1340, the Court noticed the importance of the role of witnesses in a criminal trial. The importance and primacy of the quality of trial process can be observed from the words of Bentham, who states that witnesses are the eyes and ears of justice. The Court issued a caution that in such situations, there is a greater responsibility of the court on the one hand and on the other the courts must seriously deal with persons who are involved in creating designed investigation. The Court held that legislative measures to emphasize prohibition against tampering with witness, victim or informant have become the imminent and inevitable need of the day.

Conducts which illegitimately affect the presentation of evidence in proceedings before the Courts have to be seriously and sternly dealt with. There should not be any undue anxiety to only protect the interest of the accused. That would be unfair, as noted above, to the needs of the society. On the contrary, efforts should be to ensure fair trial where the accused and the prosecution both get a fair deal. Public interest in proper administration of justice must be given as much importance if not more, as the interest of the individual accused. The courts have a vital role to play. Having analyzed and discussed in some elaboration various aspects of this case, we pass the following orders:

> ***(A) The appeal is dismissed both on merits and on quantum of sentence.***
>
> ***(B) The Director-Generals, Health Services of UP/Uttarakhand are hereby issued notice under the provisions of the Contempt of Courts Act, 1971 as to why appropriate action be not initiated against them for not complying with the directions contained in the judgment of the trial court dated 29th June, 1990.***
>
> ***(C) The above said officials are hereby directed to take disciplinary action against Dr. C.N. Tewari, PW-3, whether he is in service or has since retired, for deliberate dereliction of duty, preparing a report which ex facie was incorrect and was in conflict with the inquest report (Exhibits Ka-6 and Ka-7) and statement of PW-6. The bar on limitation, if any, under the Rules will not come into play because they were directed by the Order dated 29th June, 1990 of the Court to do so. The action even for stoppage/reduction in pension can appropriately be taken by the said authorities against Dr. C.N. Tewari.***
>
> ***(D) Director-Generals of Police UP/Uttarakhand are hereby directed to initiate, and expeditiously complete, disciplinary proceedings against PW-6, SI Kartar Singh, whether he is in service or has since retired, for***

the acts of omission and commission, deliberate dereliction of duty in not mentioning reasons for non-disclosure of cause of death as explained by the doctor, not sending the viscera to the FSL and for conducting the investigation of this case in a most callous and irresponsible manner. The question of limitation, if any, under the rules, would not apply as it is by direction of the Court that such enquiry shall be conducted.

(E) We hold, declare and direct that it shall be appropriate exercise of jurisdiction as well as ensuring just and fair investigation and trial that courts return a specific finding in such cases, upon recording of reasons as to deliberate dereliction of duty, designedly defective investigation, intentional acts of omission and commission prejudicial to the case of the prosecution, in breach of professional standards and investigative requirements of law, during the course of the investigation by the investigating agency, expert witnesses and even the witnesses cited by the prosecution. Further, the Courts would be fully justified in directing the disciplinary authorities to take appropriate disciplinary or other action in accordance with law, whether such officer, expert or employee witness, is in service or has since retired.

40. The appeal is accordingly dismissed.

2.6 ADDITIONAL CASE LAW

2.6.1 Judicial Misuse of "beyond reasonable doubt"[17]

Author's Note

This is a landmark judgment of SC on frequent acquittals. In more than 90% of the heinous crimes, the criminals are acquitted on a single plea: not proved "*beyond reasonable doubt*", by doubting Thomas's, mostly on unsound grounds; making mockery of CJS, and promoting lawlessness in the country.

The Apex Court has condemned misuse of the phrase "***not proved beyond reasonable doubt***".

Highlights italicised

2.6.2 Relevant Extracts (Verbatim)

Even at this stage we may remind ourselves of a necessary social perspective in criminal cases which suffers from sufficient forensic appreciation.

The dangers of exaggerated devotion to the rule of benefit of doubt at the expense of social defence and to the soothing sentiment that all acquittals are always good regardless of justice to the victim and the community, demand especial emphasis in the contemporary context of escalating crime and escape. The judicial instrument has a public accountability. The cherished principles or golden thread of proof beyond reasonable doubt which runs through the web of our law should not be stretched morbidly to embrace every punch, hesitancy and degree of doubt. The excessive solicitude reflected in the attitude that a thousand guilty men may go but one innocent martyr shall not suffer is a false dilemma.

Only reasonable doubts belong to the accused. Otherwise any practical system of justice will then break down and lose credibility with the community. The evil of acquitting a guilty person

17. *Shivaji Sahebrao Bobade v State of Maharashtra,* AIR 1973 SC 2622 : (1973) 2 SCC 793 : 1973 Cr LJ 1783.

light-heartedly as a learned author has sapiently observed, goes much beyond the simple fact that just one guilty person has gone unpunished. If unmerited acquittal become general, they tend to lead to a cynical disregard of the law, and this in turn leads to a public demand for harsher legal presumptions against indicted 'persons' and more severe punishment of those who are found guilty. Thus, too frequent acquittals of the guilty may lead to a ferocious penal law, eventually eroding the judicial protection of the guiltless. For all these reasons it is true to say, with Viscount Simon, that:

a miscarriage of justice may arise from acquittal of the guilty no less than from the conviction of the innocent…

2.6.3 Scientific Criminal Investigation[18]

Author's Summary

The culprit in this case, misappropriated a huge sum of Rs 594.88 crores. The police arrested and tried to interrogate him. However, he did not cooperate. The police, therefore, wanted to use Polygraph, Narco Analysis, and Brain Mapping tests. Defence alleged it is indirect physical torture and it is against Article 20(3) of the Constitution. However, the court allowed the tests, because they thought these scientific methods are substitutes for III-degree methods.

2.6.4 Relevant Extracts (Verbatim)

1. The petition is filed challenging the order passed by the learned Additional Chief Metropolitan Magistgrate, Egmore, Chennai in Crl. M.P. No. 389 of 2006 in RC 4(E)/2006-BS&FC, CBI, New Delhi in C.C. No. 19189 of 2007.

2. The petitioner has been accused of misappropriation of a sum of Rs. 594.88 crores by selling 1,30,00,000 unallotted unlisted shares of DSQ Software Limited.

3. The petitioner was arrested and produced before the learned Additional Chief Metropolitan Magistrate, Egmore, Chennai, on 14-2-2006. The learned Additional Chief Metropolitan Magistrate, Egmore, Chennai, was pleased to grant police custody from 14-2-2006 to 24-2-2006. The said police custody was extended till 27-2-2006 on the basis of the affidavit filed by the Investigating Officer. The accused was thereafter surrendered to judicial custody on 27-2-2006.

4. The respondent-police filed a petition seeking permission to conduct the Polygraph, Narco analysis and Brain Mapping test on the accused and to direct the Superintendent of Prisons, Central Jail, Chennai, to produce the accused before the FSL Bangalore on 7th and 8th March, 2006, to undergo the aforesaid tests.

5. The reason assigned in the petition seeking such a relief by the respondent herein is that the accused failed to co-operate with the investigation process undertaken during custodial interrogation. To unravel the end use of huge defrauded amount, scientific investigation will have to be carried out, it has been alleged.

6. The learned Additional Chief Metropolitan Magistrate, Egmore, Chennai, having considered the gravity of the offence alleged against the petitioner and his non-cooperation during the course of investigation under police custody, was pleased to allow the petition filed by the respondent herein.

18. *Dinesh Dalmia v State of Tamil Nadu,* 2006 Cr LJ 2401 : 2006 (4) Crimes 351 : 2006 (4) Rec Cri R 361.

7. In the criminal revision, it is contended that the accused cannot be compelled to give evidence as against him. The grant of police custody beyond 15 days, is out of the purview of section 167 of the Code of Criminal Procedure. There is an intrusion in the constitutional right of the accused to be silent under article 20(3) of the Constitution of India.

8. Learned senior counsel appearing for the petitioner-accused would submit that there is health hazard in Polygraph, Narco Analysis and Brain Mapping tests. It is an indirect physical torture launched against the accused, it is submitted. Learned senior counsel would further argue that when the accused had not given any consent to subject himself to the aforesaid scientific tests, a false statement has been given in the petition by the Investigating Officer as though the accused volunteered to face such tests. It is his further submission that the learned Additional Chief Metropolitan Magistrate, Egmore, Chennai has thrown to wind the mandatory provision as contemplated under section 167 of the Code of Criminal Procedure that the police custody shall not be permitted beyond 15 days.

9. Learned counsel for the respondent on being served with the notice, appeared and submitted that the accused has volunteered to undergo the tests. It is his submission that the question of taking the accused to police custody beyond the period of 15 days does not arise in this matter as the accused had been directed only to appear for the tests. He would further argue that the aforesaid scientific tests will have to be conducted to unravel the mystery. It is his last submission that the criminal revision case laid by the petitioner accused under section 397 of the Code of Criminal Procedure is not maintainable.

12. In this matter, the right to direct the accused to undergo scientific tests has been finally determined by the Court below and thereby the criminal proceedings taken to demystify the grey area of investigation has culminated. Therefore, the Court finds that the present order impugned which substantially determines the rights of the parties is a final order challengeable under section 397 of the Code of Criminal Procedure by way of revision.

13. Of course, Article 20(3) of the Constitution of India, recognizes the right of the accused to be silent. The Investigating Officer has come out with a version that the accused has volunteered to undergo such a test. Of course, such a contention of the Investigating Officer is disputed by the accused now.

14. Huge amount has allegedly been misappropriated by the accused and the investigating agency is completely in the dark as to the end use of such a huge amount siphoned off by the accused. The Investigating Officer did not use third decree methods to extract incriminating materials through the mouth of the accused. Only a scientific test on the accused is prayed for by the respondent-complainant. That the accused will face health hazard and his physical frame will be endangered if he undergoes such scientific tests are totally without any scientific basis. As rightly pointed out by the learned counsel for the respondent, the scientific tests are like taking MRI or CT Scan. The scientific value of such tests and the credibility thereof will have to be evaluated only during the course of trial. Unless such tests are conducted, the investigating agency may not be in a position to come out with clinching testimony as against the petitioner. Subjecting an accused to undergo such scientific tests will not amount to breaking his silence by force. He may be taken to the laboratory for such tests against his Will, but the revelation during such tests is quite voluntary. Therefore, such process does not amount to compelling a witness to give evidence as against him.

15. It has been held in the authority in *Nandini Satpathy v P.L. Dani*, AIR 1978 SC 1025 : 1978 Cr LJ 968 : (1978) 2 SCC 424 as follows (Para 53)—

> The phrase 'compelled testimony' must be read as evidence procured not merely by physical threats or violence but by psychic torture, atmospheric pressure, environmental coercion, tiring interrogative prolixity, overbearing and intimidatory methods and the like — not legal penalty for violation. So, the legal perils following upon refusal to answer, or answer truthfully, cannot be regarded as compulsion within the meaning of article 20(3).

The aforesaid authority deals with application of third decree methods to compel an accused to come out with revelation. The above authority will have no application to scientific tests which helps the Investigating Officer to unravel the mystery.

16. Under section 167 of the Code of Criminal Procedure, the learned Additional Chief Metropolitan Magistrate, Egmore, Chennai has power only to remand the accused under police custody for a total period of 15 days. Here in this case, the police custody was already granted for 14 long days. Now the respondent has not sought before the learned Additional Chief Metropolitan Magistrate, Egmore, Chennai, to give the accused to police custody for further interrogation. The respondent has only sought a permission to conduct three types of scientific tests and also a direction to the Superintendent of Central Prisons, to produce the accused to undergo such tests. Such a prayer will not amount to seeking for police custody of an accused for further interrogation. Therefore, the legal submission made by the learned senior counsel for the petitioner with regard thereto stands rejected.

17. As the accused had not allegedly come forward with the truth, the scientific tests are resorted to by the investigating agency. Such a course does not amounts to testimonial compulsion. When there is a hue and cry from the public and the human rights activists that the investigating sleuths adopt third degree methods to extract information from the accused, it is high time the investigating agency took recourse to scientific methods of investigation. The learned Additional Chief Metropolitan Magistrate, Egmore, Chennai, has granted the relief as prayed for by the respondent herein to secure the ends of justice. Therefore, there is no warrant for up-setting the order passed by the Court below.

2.6.5 Broken Custody Chain; Recovery Doubtful[19]

Mr. Singh had sent the plain and blood stained earth, one *Paijama*, one *Kurta*, one *Baniyan*, one underwear and one bullet which was recovered from the dead-body at the time of post-mortem for chemical examination. He had also sent the 'katta' which was recovered at the instance of accused Imamuddin for examination by ballistic expert.

Before proceeding further it is proper to mention the ante-mortem injuries found on the dead body of Nabi Sarvar.

1. "Firearm wound of entry 4.00 cm x 1.00 cm x cranial cavity deep on right side frontal temporal region elliptical in shape, inverted margin, edges-blackened.
2. Firearm wound of exit 2.00 cm x 1.5 cm x cranial cavity deep through and through on left side skull, 7 cm, above and lateral to left ear. Margin-everted, communicating to injury No. 1.

19. *Imamuddin v State of Uttar Pradesh,* 2009 Cr LJ 4477 : 2009 (5) All LJ 366 : 2009 (66) All Cri C 259.

3. Fire arm wound of entry 1.00 cm x 1.00 cm x chest cavity deep on left side upper part of chest 7.00 cm, above left nipple at 2 o'clock position. Margin-inverted edge-blackened. Direction downward laterally. On internal examination:

   Right frontal and temporal bones were found fractured, left parietal bone was also fractured, left and right lungs were punctured, one metallic bullet was found in the thoracic cavity.

   In the opinion of the doctor, death was caused due to shock and haemorrhage as a result of ante-mortem injuries. Death had taken place within one day.

   The learned counsel for the appellant argued that the trial court has committed illegality in finding the appellant guilty for the murder of Nabi Sarvar. When the evidence of PW-1 Zahir Ahmad and PW-2 Rais was disbelieved in respect of accused Nasruddin, it ought not to have been accepted in respect of Imamuddin. He further argued that the learned trial court has laid emphasis upon the fact that a country made pistol was recovered at the instance of Imamuddin and as per the ballistic expert report, the same was found to have been used in the commission of the crime. He argued that the prosecution has failed to prove that the alleged recovery of fire arm was pursuant to any disclosure statement of Imamuddin and that the recovery itself was doubtful as the independent witnesses of recovery namely, Mushtak Ahmad and Akik Ahmad, were not examined in the court. Moreover, the alleged recovery was made from an open place which was accessible to each and everyone. He further argued that the bullet, which was recovered from the dead body at the time of post-mortem, was sent to the Superintendent of Police, Azamgarh in a sealed cover and the prosecution has failed to lead any link evidence that it was the same bullet which was sent for examination by ballistic expert.

   Moreover, this fact can also not be left off the sight that the alleged recovery of the pistol was made on 5-6-1998 whereas the incident had taken place on 13-11-1997. Thus the recovery of the pistol has been made say about six months after the occurrence. In this connection a judgment of Hon'ble the Supreme Court in *Gopal Sah v State of Bihar,* 2009 (64) ACC 997 may be referred. In that case the accused were arrested and on their disclosure statements, blood stained axe and a sickle allegedly used in the murder.

   As the recovery of the pistol is highly suspicious and cannot be placed reliance the knowledge of the accused Imamuddin as to its concealment beneath the earth also cannot be believed.

   Learned counsel for the appellant argued that no reliance can be placed upon the report of ballistic expert (Ext Ka-6) to the effect that the bullet (recovered from the dead body of Nabi Sarvar) was fired from the pistol allegedly recovered at the instance of appellant as it is highly doubtful that the bullet remained intact and was not tampered with till its examination by ballistic expert. It is to be noted that as per the post-mortem report Ext Ka-2, the metallic bullet found in the dead body of Nabi Sarvar was kept in sealed envelope and was given to the constable who had accompanied the dead body. The prosecution has not led any evidence that after the bullet was received from the doctor where it was kept. If it was kept at the Malkhana of the police station concerned, then no police official of the Malkhana has been examined to prove that nobody was allowed to tamper with the bullet and it remained in the sealed cover till the same was sent to the scientific laboratory for examination. If the bullet was sent from the Malkhana of the Police Station to the Sadar Malkhana then no one from the Sadar Malkhana has been examined to depose

as above. However, from the report of the scientific laboratory (Ext. Ka-4) it appears that the bullet alongwith other materials (such as plain and blood stained earth and the clothes of the deceased) was received in the scientific laboratory on 20-8-1998 through special messenger. The post-mortem was done on 14-11-1997. It is thus clear that the bullet remained at the police station for about nine months and there is no reason as to why the bullet was not sent to the laboratory at an early date.

The pistol was allegedly recovered at the instance of the accused on 5-6-1998. There is no evidence on record to show as to where the pistol was kept after its recovery *i.e.,* either at the police station Malkhana or in the Sadar Malkhana. Again no link evidence has been produced to prove as to when this pistol was sent for ballistic expert examination. The ballistic expert report is (Ext. Ka-6) on the record which shows (that the pistol was received for ballistic expert examination on 24-12-1998 from the sero-section of the scientific laboratory Lucknow. However, there is no evidence as to when the pistol was sent from the police station or the Sadar Malkhana to the scientific laboratory. In any case the pistol after its alleged recovery on 5-6-1998 reached the ballistic expert only on 24-12-1998 and no reason for this delay has been given. It is therefore, apparent that the police had in its possession not only the bullet recovered from the dead body but also the pistol which was allegedly recovered at the instance of accused Imamuddin and there was ample opportunity with the Investigating Officer to tamper with the bullet during this period. The inordinate delay in sending the bullet and pistol for scientific and ballistic expert elimination creates strong suspicion whether the alleged recovered bullet was sent to the ballistic expert or in its place another bullet fired from the recovered pistol was sent to the ballistic expert for comparison as there was ample opportunity for the police to have done so. In these circumstances the report of the ballistic expert also loses its importance.

2.6.6 Good Evidence[20]: [The Acid Test for truthful evidence: Cross-examination]

Now it is true that it is an elementary principle of law that evidence, which cannot be tested must be rejected. There are two methods of testing evidence and ensuring that truth comes out in evidence. The first is by administration of oath and the other is by cross-examination. The administration of oath is designed to secure truthfulness in evidence by providing not only moral sanction but also sanction of perjury. Cross-examination, on the other hand, extracts truth and exposes falsehood much against the will of the person examined. The exercise of the right of cross-examination has always been regarded as one of the most efficacious tests which the law has devised for discovery of truth. So important is the right that the law declares that no evidence affecting a party is admissible against that party unless the latter has had an opportunity of testing its truthfulness by cross-examination.

The opinion of the chemical examiner stands on the same footing as any other piece of evidence, and it is difficult to see how any reliance can be placed on the opinion unless it is supported by good reasons founded on facts, which warrant the opinion. If the reasons are good and convincing and the factual data, on the basis of which the opinion is formed, warrant the opinion, the court will rely on the opinion and hold on the basis of the opinion that the concentration of alcohol in the blood of the accused was as opined by the chemical examiner. If, however, the factual data is not clear or adequate or the reasons are frivolous or inconclusive, the opinion will have no probative value. That is the reason why section 51 of the Indian Evidence Act provides that whenever the opinion of any living person is relevant the grounds

20. *Suleman Usman Memon v State of Gujarat*, AIR 1961 Guj 120 : (1961) 2 Cr LJ 78 (Guj). Also see *Emperor v Behram Irani*, AIR 1944 Bom 321 : 46 Bom LR 481 : 46 Cr LJ 162.

on which such opinion is based are also relevant. It would be most unsafe to convict the accused on the basis of a report which contains merely the *ipse dixit* of the chemical examiner and which does not contain any factual data or any grounds or reasons which the court can examine for the purpose of deciding whether the opinion contained in the report is correct or not. To convict the accused on the basis of such a report would be to leave the decision of the case in the hands of the chemical examiner, which certainly the court cannot do.

2.6.7 Eyewitness Accounts v Medico-Legal Expert Evidence[21]

The contention on which considerable emphasis has been laid by the learned counsel for not believing the eyewitnesses is that their evidence is in conflict with the medical evidence.

There is a three-pronged attack of the learned counsel. His contention is that according to the direct evidence there were two fires which hit the deceased whereas according to the medical evidence there was only one entry wound and two exits. Therefore, the direct evidence is belied. Another branch of his argument in this connection is that the gunshot wound in the chest of the deceased caused a big hole which must have resulted in profuse bleeding, but no blood was found from the hut in which the first shot is said to have been fired up to the place where the deceased fell dead on account of the second gunshot in the back. The third branch of his argument is that no wads and pellets were found inside the hut.

The evidence of the doctor, in our opinion, does not exclude the possibility of there being two gunshots which may have struck the deceased. May be, that the second gunshot alleged to have been fired from behind by the assailant while the deceased was running, was not effective. On the basis of indefinite opinion of the medical expert as in the present case, we are not prepared to reject the direct evidence.

Learned public prosecutor has also urged that most of the pellets of the second gun-fire may not have hit the victim on account of wide dispersion and the eye witnesses may have thought that the second gun-shot hit the back of the deceased. The explanation furnished by the learned public prosecutor cannot be said to be altogether devoid of force. In *Mohanlal v State of Rajasthan,*[22] it was observed that:

> *There is always a tendency to over-emphasise discrepancies between the evidence of eyewitnesses and medical testimony. These discrepancies should be treated and appraised just like other discrepancies in the statements of the witnesses. It cannot be forgotten that the eyewitnesses may not give a very correct and accurate account of the version and may at places make exaggerations or may fail to give correct facts either on account of lapse of memory or on account of inability to observe minutely or to recite correctly. It should also be borne in mind that sometimes, the medical officers also do not bestow sufficient care while performing examinations and their opinions may not be properly formed on account of inadequate or defective examinations or lack of complete knowledge. It is, therefore, hardly fair to expect a complete and perfect correspondence between the medical evidence and the eye-testimony. Naturally, therefore, the court may carefully examine the discrepancies and if it is reasonably open to arrive at a substantial and true version of the prosecution case, the courts should not adopt the easy course of throwing away the prosecution case on the alleged discrepancies between the medical evidence and the eye-testimony.*

In *Nanhku Singh v State of Bihar,*[23] their Lordships of the Supreme Court observed as follows:—

> *When a person fires at a place where, as here, there are two persons one witness may think that it is fired at one person and the other may think that it was fired at the other. Merely because the inference drawn by one witness which may not fit in with the inference drawn by the other*

21. *Ram Narain v State of Punjab,* AIR 1975 SC 1727 : 1976 SCR (1) 27.
22. *Mohanlal v State of Rajasthan,* AIR 1961 Raj 24 : 1960 Raj LW 565 : (1961) 1 Cr LJ 155.
23. *Nanhku Singh v State of Bihar,* AIR 1973 SC 491 : 1972 SCD 793 : 1972 Cr LJ 1204.

> *the factum of the firing at the place where the injured persons were, cannot be rejected. It cannot be held that the witness is a liar and he wanted to falsely implicate the appellant and others.*

Again in *Nihal Singh v State of Punjab,*[24] an argument regarding contradiction between medical evidence and direct evidence was repelled by their Lordships of the Supreme Court in this way—

> Another fact relied upon by the learned additional sessions judge in discrediting the eyewitnesses is that the witnesses stated that the deceased gave a *takwa* blow on the head of Nihalsingh, but the medical examination showed only a small abrasion on his left thumb. The High Court explained that the witnesses must be describing only the movements of the accused with their weapons and they could not obviously give evidence as to where a particular weapon hit the body for that would depend upon not only the manner in which the person wielded their weapons but also on the movement of the victim. A hit aimed at the head may, if the victim moves aside, miss altogether the body of the victim or fall on a part of his body different from that aimed at. There is certainly force in what the High Court said.

Applying the reasoning adopted by their Lordships of the Supreme Court in the cases cited above, the so-called contradiction or conflict between medical evidence and direct evidence pointed out by the learned counsel in the present case is, in our opinion, clearly explicable. May be, that the second shot did not hit the victim and the witness may have got an impression that the shot hit the victim at the back. May be, that only a few pellets of the second shot hit the victim and the rest went amiss. In our opinion, nothing turns upon this so-called contradiction or conflict between medical evidence and direct evidence.

In respect of PW/5, Smt. Jannat's statement learned counsel has drawn our attention to another discrepancy and it is this that Smt. Jannat states that the victim was at a distance of about one-pace (roughly five feet) from the muzzle whereas according to PW 3 Khanu the accused fired the gunshot which hit Gamu from a distance of about six to seven paces. In our opinion, nothing substantially turns upon the discrepancy in the distance. In *Janak Singh v State of Uttar Pradesh,*[25] their Lordships of the Supreme Court observed as follows:—

> *According to Dr. Ghosh's evidence, none of the three entry wounds showed any blackening or tattooing. Obviously, therefore, the firing did not take place from a very close range but from some distance at least. No doubt, the three eye-witnesses gave different distances ranging from two to six paces. But they could hardly be expected to have marked at the time the precise distance at which the person shooting the firearm was. They, therefore, gave an estimate of the distances at which he was from the victim. It is no wonder that the distances they deposed varied. Nothing can, therefore, turn on such variation.*

In this connection, learned counsel has laid much emphasis on the fact that no blood marks were found either in the hut of Fatehsingh-wali, where the first shot is alleged to have been fired, nor outside the hut up to the place where the victim fell after the alleged second shot. Learned counsel has argued that looking to the size of the wound caused by the first shot, there must have been profuse bleeding and some blood must have fallen on the ground. But since there is no evidence that there was any blood either in the hut or on the way, the direct evidence is false. In our opinion, the argument, though it appears attractive, has no substance. We have it in the evidence that due to winter season the deceased was putting on shirt and woollen coat. Further he had pressed the wound while running with both of his hands. The clothes of the victim were found hardly soaked with blood and it is quite possible that no such quantity of blood may have fallen either in the hut or on the way as may be collected for the purpose of investigation. A lot of blood spread out at the place where the victim fell. It is also possible

24. *Nihal Singh v State of Punjab,* AIR 1965 SC 26 : (1964) 4 SCR 7 : (1965) 1 Cr LJ 105.
25. *Janak Singh v State of Uttar Pradesh,* AIR 1972 SC 1853 : (1973) 3 SCC 50 : 1972 Cr LJ 1177.

that the man might have bled internally after receiving the first gun-shot wound. Thus, in our opinion, absence of blood marks in the hut or on the way is sufficiently explained.[26]

> 2. In other words, the position is that if we discard this part of the evidence of the eye-witness which has come to light for the first time in the Sessions Court, then according to medical evidence, the deceased would have got two gunshots whereas it was never the prosecution case that Ram Narain Singh or any other accused fired a second shot at the deceased at any time. The medical evidence, therefore, clearly falsifies the prosecution case regarding the manner in which the deceased was hit.

Even the ballistic expert on a question by the court deposed as follows:—

> In case if it is a straight fire, and if the right arm is kept just in front of the chest, then it is possible that these injuries could be caused by one single fire.

Thus, according to the ballistic expert's evidence, unless there was cogent material and reliable evidence to show that the deceased had kept his right arm in front of his chest, the deceased could not have sustained less than two injuries. The evidence of Surjit Singh and Joginder Singh on this point appears to us to be clearly an afterthought and cannot be accepted. Thus, the prosecution has not been able to explain how the deceased died by sustaining one gunshot injury. Furthermore, the evidence of Dr. SS Walia shows that there were two gunshot injuries on Teja Singh, namely, injury No. 1 which by itself was sufficient to cause his death, and injury No. 4 which was also the result of the gunshot. The doctor has further opined in his cross-examination that both injuries Nos. 2 and 4 could have been caused from a distance of less than 4 feet and that there was blackening both on injury Nos. 4 and 2, which were on the uncovered parts of the body. The doctor further deposed that there was corresponding burning of the shirt by injuries Nos. 2, 3 and 4. If this be the position, then injury No. 4 is not at all explained. The blackening on injury No. 4 clearly indicates that this was also a gunshot injury and the ballistic expert has also testified to the effect at p 60 of the High Court paper book that in case the blackening, which has been reported by the doctor in injury No. 2 and injury No. 4, were not the actual blackening due to the powder gases then it is possible that it could be from one single fire. The doctor, however, says nothing of this sort. Thus, a combined reading of the evidence of Dr. Walia, the medical expert and Mr. JK Sinha, ballistic expert, clearly establishes that the deceased died of two gunshot injuries and the prosecution has not been able to explain this important circumstance. For these reasons, therefore, the evidence of the two eye-witnesses Surjit Singh and Joginder Singh is wholly inconsistent with the medical evidence as also the evidence of ballistic expert and must be rejected on this ground alone, apart from other inherent improbabilities, which appear in their evidence and which have already been pointed out.

2.6.8 *Corpus Delicti*[27]

Mr. Banerjee has further urged that even if there was no body or trace of a body or any direct evidence as to the manner of death of a victim, the *corpus delicti* may be proved by other circumstances. He has referred in this connection to the case of *Arun Kumar Banerjee v State,*[28] Mr. PB Mukherji and Mr. NK Sen JJ, held in that case at pages 507 and 508 that:

> We cannot accept the broad proposition urged for the appellants that there can be no conviction on a charge of murder on circumstantial evidence …

In a decision of the English Courts in *Reg. v Onufrejczyk,*[29] Lord Goddard CJ, of England lays down the principle that in a trial for murder, the fact of death can be proved by circumstantial

26. *Hussain Khan v State of Rajasthan*, 1976 Cr LJ 821 : 1975 Raj LW 374 : 1975 WLN 587.
27. *Bhulakiram Koiri v State of West Bengal*, 1970 Cr LJ 403 : 73 Cal WN 467 : ILR (1969) 1 Cal 39.
28. *Arun Kumar Banerjee v State,* AIR 1962 Cal 504 : (1962) 2 Cr LJ 354.
29. *Reg. v Onufrejczyk,* (1955) 1 QB 388 : (1955) 1 All ER 247.

evidence … . The learned Lord Chief Justice of England lays down the further principle that notwithstanding that there is no body, or trace of a body, or any direct evidence as to the manner of death of a victim, the *corpus delicti* may be proved by such circumstances as render the commission of the crime certain and leave the jury with no degrees of doubt. That, in our view, presents the correct proposition and we respectfully agree with that statement of the law. In a later decision of the Supreme Court in the case of *Raghav Prapanna Tripathi v State of Uttar Pradesh,*[30] their Lordships observed at page 88 as follows:—

In *King v Horry,*[5] the head note states the law as follows:

> *At the trial of a person charged with murder the fact of death is provable by circumstantial evidence, notwithstanding that neither the body nor any trace of the body has been found and that the accused has made no confession of any participation in the crime. Before he can be convicted, the fact of death should be proved by such circumstances as render the commission of the crime morally certain and leave no ground for reasonable doubt; the circumstantial evidence should be so cogent and compelling as to convince a jury that upon no rational hypothesis other than murder can the facts be accounted for.*

This statement of the law was approved in *Reg v Onufrejczyk,*[3] except as to moral certainty and that statement of the law has received approval of the Supreme Court in *Anant Chintaman Lagu v State of Bombay*.[3127] It was also said in *R v Horry:*[32]

> That the jury, viewing the evidence as a whole, was entitled to regard the concurrence of so many separate facts and circumstances themselves established beyond all doubt, and all pointing to the fact of death on or about July 13, 1943 – as excluding any reasonable hypothesis other than the death of the person alleged to have been murdered and as having therefore sufficient probative force to establish her death.

We agree with the contention of Mr. Banerjee as a whole that the circumstances as proved in the present case are such that the *corpus delicti* has been proved thereby and even if not so, the commission of the crime and the relative offence charged can be established, if the circumstances on record lead on to establish the crime beyond reasonable doubt.

2.6.9 Corroboration[33]

We have found earlier that the High Court had discarded the evidence of eyewitnesses on superficial and unsubstantial ground. Apart from the fact that there were no justifiable grounds for rejecting their testimony, we are greatly impressed by the evidence of P.W. 1 and the substantial corroboration received by it from the First Information Report and the medical and the expert evidence. An examination of the First Information Report shows that Bakshish Singh was responsible for firing two shots at Karam Singh and one shot at Gurdeep Singh. He was alleged to have shot once at the legs and later again at the neck of Karam Singh and once on the right thigh of Gurdeep Singh. The medical evidence supports the evidence of P.W. 1 and what is more important is that the medical evidence is in tune with the First Information Report. The empty cartridges, which were found at the scene of occurrence, show that two of them found near Karam Singh and one found near Gurdeep Singh were shot from the Pistol of Bakshish Singh. The manner in which the medical evidence and the expert evidence fit in with the earliest version given by P.W. 1 in the First Information Report, to our mind, justifies our placing implicit reliance on her evidence.

30. *Raghav Prapanna Tripathi v State of Uttar Pradesh,* AIR 1963 SC 74 : (1963) 1 Cr LJ 70 : (1963) 3 SCR 239.
31. *Anant Chintaman Lagu v State of Bombay*, AIR 1960 SC 500 : (1960) 2 SCR 460 : 1960 Cr LJ 682.
32. *The King v Horry*, (1952) NZLR 111.
33. *Rama Nand v State of Himachal Pradesh,* AIR 1981 SC 738 : (1981) 1 SCC 511 : 1981 Cr LJ 298 (SC).

Although the High Court has held that the body recovered was that of Sumitra deceased and that the bones sent to the medical experts were not parts of the decomposed body found, but appeared to have been fraudulently replaced with the bones of a child during transmission to the medical experts, we would assume that the identity of the body found in the river was not established beyond reasonable doubt. In other words, we would take it that the *corpus delicti*, i.e., the dead body of the victim was not found in this case. But even on that assumption, the question remains whether the other circumstances established on record were sufficient to lead to the conclusion that within all human probability, she had been murdered by Rama Nand, appellant. It is true that one of the essential ingredients of the offence of culpable homicide required to be proved by the prosecution is that the accused "caused the death" of the person alleged to have been killed.

This means that before seeking to prove that the accused is the perpetrator of the murder, it must be established that homicidal death has been caused. Ordinarily, the recovery of the dead body of the victim or a vital part of it, bearing marks of violence, is sufficient proof of homicidal death of the victim. There was a time when under the old English Law, the finding of the body of the deceased was held to be essential before a person was convicted of committing his culpable homicide. "I would never convict", said Sir Mathew Hale, "a person of murder or manslaughter unless the fact were proved to be done, or at least the body was found dead". This was merely a rule of caution, and not of law. But in those times when execution was the only punishment for murder, the need for adhering to this cautionary rule was greater. Discovery of the dead body of the victim bearing physical evidence of violence, has never been considered as the only mode of proving the *corpus delicti* in murder. Indeed, many cases are of such a nature where the discovery of the dead body is impossible. A blind adherence to this old "body" doctrine would open the door wide for many a heinous murderer to escape with impunity simply because they were cunning and clever enough to destroy the body of their victim. In the context of our law, Hale's enunciation has to be interpreted no more than emphasising that where the dead body of the victim in a murder case is not found, other cogent and satisfactory proof of homicidal death of the victim must be adduced by the prosecution. Such proof may be by the direct ocular account of an eye-witness, or by circumstantial evidence, or by both. But where the fact of *corpus delicti*, i.e., "homicidal death is sought to be established by circumstantial evidence alone, the circumstances must be of a clinching and definitive character unerringly leading to the inference that the victim concerned has met a homicidal death. Even so, this principle of caution cannot be pushed too far as requiring absolute proof. Perfect proof is seldom to be had in this imperfect world and absolute certainty is a myth. That is why under section 3, Evidence Act, a fact is said to be "proved", if the court considering the matters before it, considers its existence so probable that a prudent man ought, under the circumstances of the particular case, to act upon the supposition that it exists. The *corpus delicti* or the fact of homicidal death, therefore, can be proved by telling and inculpating circumstances which definitely lead to the conclusion that within all human probability, the victim has been murdered by the accused concerned. In the instant case, circumstances (1) to (5) in their cumulative effect, are not only inconsistent with the innocence of Rama Nand appellant, but ineluctably and rationally compel the conclusion that Sumitra has died and it is Rama Nand appellant who has intentionally caused her death. Circumstance (3) involves an admission by Rama Nand and Shish Ram accused that Sumitra has met an unnatural death. The only difference between the prosecution version and the defence version is as to whether Sumitra committed suicide or had been killed by Rama Nand appellant. It has been found that the story of the suicide set up by the accused is false. The articles Salwar (Ex. P-14) and the Shoes (Ex. P-15) do not belong to her. They were planted by the accused to lay a false trial and to misdirect the investigation. This circumstance taken in conjunction with the others, irresistibly and rationally leads to the conclusion that she has been

murdered by Rama Nand appellant and her dead body has been disposed of by the appellant Shish Ram and Kali Datt.

2.6.10 Third Degree Methods[34]

It is plain common sense that suspects are seldom willing to furnish a quick and correct clue to the crimes for which they are arrested. A certain amount of coaxing and promising has inevitably to be done in order to persuade the accused to disclose at least the outlines of the crime. But the use of strong methods of investigation, apart from raising problems concerning the observance of decency in public affairs and of human dignity, is fraught with the danger that the very process by which evidence is collected may become suspect and fail to inspire confidence. Ganpat, the approver, was driven to admit that he was tortured while in the lock-up and we have serious doubts whether the injury caused on his head was, as alleged by the police, self-inflicted. A witness called Ramchandra also admitted that while under interrogation the police pulled out his pig tail. We have registered the failing which tempts even judicially trained minds to revolt against such methods and throw the entire case out of hand. But we must, with hopes for the future, utter a word of warning that just as crime does not pay, so shall it not and witnesses during the course of investigation. History shows that misuse of authority is a common human failing and, therefore, courts must guard against all excesses. The police, with their wide powers, are apt to overstep their zeal to detect crimes and are tempted to use the strong arm against those who happen to fall under their secluded jurisdiction. That tendency and that temptation must, in the larger interests of justice, be nipped in the bud.

On the question whether the remarks that accused was injured are justified, we have also perused the medical report of the chief medical officer dated 11 May 1968 from which it is evident that he had found six injuries on the accused, and one of them was such that he advised X-ray though later it was found that there was no fracture. The nature of these injuries as well as the condition of the accused at the time when he was produced before the learned judge fully justify the conclusions that the accused when produced before the court was found "suffering grievously from the after effects cumulatively of those injuries".

In our view there is no warrant for the submission that the appellants were not given an opportunity to explain nor that no enquiry could be made. The appellants had opportunity of filing their affidavits and to give their version which they have done in great detail, which shows that they knew what the allegations against them were. If they wanted to produce any other person in support of their stand that the accused was only arrested on the 10th and not on the 5th or that the injuries found on the accused were old and were not fresh they could have done so. They do not deny that the chief medical officer examined the accused nor is it possible for them to say how the injuries found on the accused some of which were fresh could be caused. They were certainly not old injuries nor is it their case that when the accused was arrested on the 10th he was found to be suffering from swollen feet or injuries which were fresh. None of the remarks to which exception has been taken, in our view could be described as unwarranted, unnecessary, or irrelevant or can be characterised as generalisation or of a sweeping nature. There is, therefore, no ground for granting the prayer for expunging any of the remarks in the order of the High Court. In this view the appeal is dismissed.[35]

There is not the remotest possibility of these injures being caused in any other way except by third-degree methods. The site of injuries 2 and 3 on Amin makes it highly probable that he was struck repeatedly with a blunt weapon in the soles of his feet. There is also a strange symmetry in the injuries of Shakira, which indicates a planned beating, and she was subjected to a greater torture because she was weaker and more likely to break and confess.

34. *Dagdu v State of Maharashtra*, AIR 1977 SC 1579 : 1977 Cr LJ 1206 : (1977) 3 SCC 68.
35. *Jage Ram v Hans Raj Midha*, AIR 1972 SC 1140 : (1972) 1 SCJ 272 : 1972 Cr LJ 768 (SC).

We have occasionally commented upon the questionable methods adopted by the investigating officer in investigating crimes, but Sri Naim seems to us to be one of the most outstanding and brilliant exponents of the cult of baton even amongst his own special class.

The trial court while discussing these injuries observed:

> However, the injuries on the person of Shakira are quite large in number and suggest that she was probably beaten after her arrest. That may have been done to extract confession from her on 16-6-1956, but there is no confession on the record and in any event the beating given to her after being brought to police station from Imalia on 16-6-1956, is not material so far as the merits of the case are concerned.

The line of reasoning adopted by the trial court apart from being fallacious shows a lamentable lack of judicial approach. It shows an alarming tendency practised by so many judicial officers, namely averting the eyes so that the unpleasant truth may not be seen. Justice cannot be divorced from truth and the first duty of a person who is entrusted with the task of administering justice is to do his best to reach the truth.

But it is a sad commentary on the existing conditions that even the most glaring misbehaviour of the investigating agency in criminal cases quite frequently goes unnoticed by the trial courts and instead of severely condemning these practices, they go to the length of accepting spurious explanations offered by the prosecution. They do not seem to realize that by this attitude they not only encourage but contribute to the non-observance of the rule of law.

Apart from the injuries discussed above there is another important piece of evidence which strongly corroborate the contention of the appellants that they were arrested earlier and not on the morning of the 16th of June. When Shrimati Shahida (P.W. 2) was examined before the magistrate she stated that on the third day of disappearance of Nabbo the sub-inspector came with Shakira and searched her house. Shrimati Zaibun (P.W. 3) went a stage further and stated before the magistrate that the ornaments were recovered on the third day of disappearance. Both these witnesses denied their earlier statements, but could not explain how they came to be recorded.

The trial court attached no importance to these statements on the ground that witnesses were simple village women who were led to make these statements by clever cross-examination. In our opinion these two witnesses in an unguarded moment blurted out the truth and then they were made to disown statements in the interests of the prosecution.

These statements clearly prove that the appellants were not arrested on the morning of the 16th of June and Naim fabricated the police records in order to hide the illegal detention of the appellants for several days. He staged their arrest on the morning of the 16th of June when he had broken their resistance by third-degree methods and they were ready to make disclosures.

To sum up our conclusions, we find that Naim committed perjury in order to hide his intimacy with and the influence over the witnesses. He safely used them to fabricate links of circumstantial evidence. He arrested the appellants probably on the 13th of June but in order to subject them to compulsion for some days he fabricated the police records and staged a fictitious arrest on the morning of the 16th June. Lastly, by methods of torture, he got disclosures. It is in this background that we will assess the remaining four pieces of circumstantial evidence.

2.6.11 Police Padding[36]

The accused is said to have made a disclosure statement (as per Exhibit P.W. 10-A) to the police inspector Bhim Singh (P.W. 16) that he had kept the knife near Chhaju Colony, Shahdara

36. *Bhola Nath v State,* 1976 Cr LJ 1409.

adjacent to a coconut tree in the field in the bushes and that he would get the same recovered after pointing it out. This statement is said to have been made in the presence of Shuja Uddin (P.W. 10) and Mohd. Asfeen (P.W. 11) which was seized under a memo (Ex. P.W. 1-C). The said knife was not even sent for serological examination because it was not said to contain bloodstains. It was not shown to the doctor who conducted the post-mortem or even to any other doctor who was examined. The learned Additional Sessions Judge rightly did not attach any weight to the recovery of the said knife in the view that it did not contain bloodstains. Without any bloodstains on it there is no guarantee that the same was used in this case. It is needless, therefore, to be detained by the said recovery even though Mr. Frank Anthony, learned counsel for Bhola Nath, went the length of contending that a knife had been "falsely planted" by the police in this case.

2.6.12 Stock Witness[37]

Who will police the police? Is freedom of movement unreasonably fettered if policemen are given power of externment for public peace? These twin problems of disturbing import, thrown up by this bizarre case, deserve serious examination.

Certain facts emerge as fairly probable from the affidavits of both sides. Prem Chand made a living as a *paniwala* or vendor of soft drinks near Delite Cinema even as a teenager, which shows that he had very poor beginnings. How did he fall into thralldom of the local police? He explains it in his affidavit:

He had a few mobile carts which were used for refrigerating water. These carts used to be parked by the petitioner on the road side due to the indulgence of the police. He was in his teens when he started his avocation and continued for a very long time. Thus, he acquired an *alias*, i.e., Prem Chand Paniwala.

Due to close association with police and their connivance and indulgence, the petitioner thrived. In this process, the petitioner became a pray and pawn in the hands of the police. He was persuaded to be their perpetual stooge and stock witness.

The petitioner in the year 1956, when he was 25 years' old was involved in a gambling case by the police to mould him a permanent stock witness and lest he should be militant to defy them. Despite his hesitation and unwillingness he was forced to become a permanent pawn of the police. This is how, the petitioner landed himself in the web of the police; he had no alternative than to be like that as his livelihood was dependent upon the mercy and indulgence of the police.

The version of the petitioner is that once he yielded to the pressure of the police to give false testimony disclosing a rubberised conscience and unvoracious readiness to forswear himself, there was escalation of demands upon him and he became a regular paddler of perjury "on police service". Indeed, counsel for the petitioner argued that his client was a "stockwitness" because he had to keep the police in good humour and obliged them with tailored testimony in around 3,000 cases because the alternative was police wrath. We were flabbergasted at this bizarre confession but to lend credence to his assertion counsel produced a few hundred summonses where the petitioner was cited as a witness. Were he not omnipresent, how could he testify in so many cases save by a versatile genius for loyal unveracity? For sure, the consternation of the community at this flood of perjury will shake its faith in the veracity of police investigation and the validity of the judicial verdict. We have no doubt that the petitioner, who has given particulars of a large number of cases where he had been cited as witness, is speaking the truth even assuming that 3,000 cases may be an exaggeration. In

37. *Prem Chand v UOI,* AIR 1981 SC 613 : (1981) 1 SCC 639 : 1981 Cr LJ 5 (SC).

justice, justices and justicing and likewise in the police and policing, the peril to the judicial process is best left to imagination if professional perjurers like the self-confessed Paniwala are kept captive by the police, to be pressed into service for proving "cases". Courts, trusting the police may act on apparently veracious testimony and sentence people into prison. The community, satisfied with such convictions, may well believe that all is well with law and order. We condemn, in the strongest terms, the systematic pollution of the judicial process and the consequent threat to human rights of innocent persons. We hope that the higher authorities in the department who, apparently, are not aware of the nefarious activities going on at the lesser levels will immediately take measures to stamp out this unscrupulous menace.

The petitioner's reply affidavit makes startling disclosures about the police methods of implicating innocent people. However, the version of the petitioner can hardly be swallowed since he is a self-confessed perjurer. Nevertheless it is not too much to ask government to take effective measure to prevent police methods straying into vice. We hopefully remind the state about what Brandiase J once observed; *Olmestead v US.*[3836]

> *Crime is contagious. If the government becomes a law breaker, it breeds contempt for law"...."To declare that in the administration of the criminal law the end justifies the means to declare that the government may commit crimes in order to secure the conviction of a private criminal would bring terrible retribution. Against that pernicious doctrine this court must resolutely set its face."*
>
> In the same American decision we have just mentioned Justice Holmes observed; "We have to choose, and for my part I think it a less evil that some criminals should escape than that the Government should play an ignoble pact.

2.6.13 Voluntary Confession[39]

The accused was arrested on 3 June 1974. The Superintendent of Police (C.I.D.) made a written request to the Magistrate for recording the confession of the accused. The Magistrate passed an order that the confession would be recorded on the following day and directed that the accused be brought from the judicial lock-up on 14 June 1974, and produced before him at 7 a.m. On 14 June 1974, the accused was accordingly produced from the judicial lock-up in the morning and produced in the court before the Judicial Magistrate. After detailed preliminary questioning and warning, the Magistrate gave about 15 minutes more for reflection to the accused. When, as a result of these preliminary proceedings, he was satisfied that the confession was being voluntarily made, he started recording the confessional statement of the accused at about 8.45 a.m. After first recording the confession in another case, the Magistrate recorded the confession of the accused, pertaining to the murders in the instant case. The Magistrate put pointed and searching questions to the accused to ensure that the confessions were being made voluntarily. He specifically asked the accused about the date of his arrest and the period of detention in police custody. He then asked him how the police had treated him during the police custody. The accused replied in categorical terms that he had not been beaten or maltreated or threatened by the police. The Magistrate asked the accused:

> *Whether you were told if you made the confession you would be released or pardoned or that you would get any other benefit?*

The accused replied,

> I was not told that if I made the confession I would be released or pardoned or that I would get any other benefit.

38. *Olmestead v US,* (1928) 277 US 438 : 72 Law Ed 944 : 48 S Ct 564.
39. *Som Parkash v Delhi Administration,* 1974 Cr LJ 784 (SC).

The Magistrate explained to the accused that in no case, whether or not he made a confession, his custody would be handed over to the police. To this, the accused replied:

> I am making confession out of my free will. I have understood.

The Magistrate further explained in clear, unmistakable terms to the accused that he was not bound to make a confession and if he did so, the confession might be used as evidence against him. After giving the accused 15 or 20 minutes more for reflection, the Magistrate recorded the confession of the accused, at first the one relating to the other case, and thereafter, the confession pertaining to the instant case.

A circumstance also taken into consideration by the Supreme Court assessing its voluntary character was that the confession was not retracted at the earliest, it was made on 14 June 1974. The trial commenced on 10 January 1975 when the charges were framed and read over to the accused. This was the earliest opportunity at which he could retract the confession, particularly when he was defended by an experienced counsel. But he did not do so on this occasion, though he pleaded not guilty to the charges.

The accused was examined under section 313, Code of Criminal Procedure on 14 June 1977. It was on this day, during his examination, he, for the first time, retracted the confession. He denied even the *factum* of making this confessional statement (Exhibit P-39) when the same was read over to him. In this connection, he stated:

> I was not in senses at that time. He was severely beaten by the police and was forced to appear before the Magistrate. Therefore, what had happened, I did not know because I had become unconscious. I was intoxicated with wine in the Rest House Raisinghnagar before I was produced before the Magistrate. I was produced before the Magistrate in a state of intoxication.

This belated plea of beating by the police was not credible. No question was put to the investigating officers S Shri Kashi Prasad Srivastava (P.W. 16) and Bhanwar Lal (P.W. 18), in cross-examination, to show that they had beaten, threatened, or otherwise induced the accused to make the confession.

Equally unfounded was the plea that wine was administered to him (by the police) in the Rest House before producing him before the Magistrate for recording the confession. Firstly, the accused was in the judicial lock-up for the preceding two days, from where he was brought under the orders of the Magistrate and produced at 7.15 a.m. Secondly, if the accused was then dead-drunk, this fact could not have escaped the notice of the Judicial Magistrate.

The Magistrate, Bansal was examined as P.W. 7. One of the questions put to him in cross-examination by the defence was:

> Did you enquire from the accused as to how the police had meted out good treatment to him?

Shri Bansal replied:

> The accused did not tell me that the police had given him wine, meat and thus treated him well.

He stated that good treatment was meted out to him.

The story propounded by the accused that at the time when he was produced before the Magistrate for recording his confession, he was dead-drunk that he did not know what he was doing was too fantastic to be believed. If the accused was then reeking of alcohol and unfit to make a statement as he wanted to have it believed, the Magistrate would not have failed to note this fact. It is impossible to believe that the confessional statement was not made by the accused but was cooked up by the Judicial Magistrate himself.

Mr. SK Bansal was further questioned:

> Did you believe that the police had assured the accused that in case he made the confession, he would be pardoned and that, he would not be challenged in this court?

Bansal refused this suggestion, stating:

> I had put questions in this regard to the accused to which he replied that the police had not assured him that if he made the confession, he would not be charged or pardoned. I was convinced from his replies that he was making, *i.e.,* statement voluntarily and not under any pressure or inducement.

It was, therefore, held that the confession was voluntary.

2.6.14 Trustworthiness of Police[40]

The appellant's general denunciation of investigating officers as a suspect species also ill merits acceptance. The demanding degree of proof traditionally required in a criminal case and the devaluation suffered by a witness who is naturally involved in the fruits of his investigating efforts, suggest the legitimate search for corroboration from an independent or unflattering source – human or circumstantial – to make judicial certitude doubly sure. Not that this approach casts any pejorative reflection on the police officer's integrity, but that the hazard of holding a man guilty on interested, even if honest, evidence may impair confidence in the system of justice. We are aware of the exaggerated criticism of the police force as a whole and of the reluctance of the framers of the Criminal Procedure Code to trust statements recorded by police investigators but these are, partly at least, the hangover of the British past. Today, trust begets trust and the higher officers of the Indian police, especially in the Special Police Establishment, deserve better credence. We are certainly inclined not to swallow the evidence of P.Ws. 7 and 8 without scrutiny but after having heard the appellant at length, we are prepared to agree with the High Court that the evidence of P.Ws. 7 and 8 are substantially correct. Even here, we must underscore the importance of the findings of the trap experiment, since they go a long way to underwrite the veracity of the prosecution story[41].

The learned sessions judge has taken up the attitude of distrust towards the police for which it is difficult to find any justification in the evidence — an attitude which I regret to say, is becoming a growing feature of judgments of subordinate magistrates. When at the trial it appears to the court that a police has in the discharge of his duty, abused his position and acted oppressively, it is no doubt its clear duty to express its stern disapproval of his conduct. But it is equally its duty not to assume such conduct on the part of the officer gratuitously and as matter of course when there is, and in this case, no reasonable basis for it in the circumstances. The presumption that a person acts honestly applies as much in favour of a police officer as of other persons and it is not a judicial approach to distrust and suspect him without good grounds. Therefore, such an attitude could do neither credit to the magistracy nor good to the public. It can only run down the prestige of the police administration.[42]

The learned magistrate held that the other two prosecution witnesses Bant Singh, Head Constable, P.W. 4, and Kuldip Singh, excise inspector, P.W. 3, are public servants and are, therefore, naturally interested in the success of the case and their evidence cannot be held to be sufficient to prove the prosecution story. This approach is wholly wrong and incorrect. It is well-settled that *prima facie* the public servants must be assumed to act honestly and conscientiously. It would, therefore, be basically wrong, without other cogent ground, to consider them as untrustworthy witnesses in respect of their activities in performance of their

40. *Som Parkash v Delhi Administration,* 1974 Cr LJ 784 (SC).
41. *Som Parkash v Delhi Administration,* 1974 Cr LJ 784 (SC).
42. *Aher Raja Khima v State of Saurashtra,* 1956 Cr LJ 421 (SC).

official duties merely because of their official status unless the evidence is considered to be suspicious and that conviction of the accused cannot be sustained on the statements of official witnesses. The presumption that a person acts honestly applies as much in favour of a police officer as of other persons, and it is not a judicial approach to distrust and suspect him without good reasons. It appears that the magistrate was bent upon acquitting the accused somehow or the other. No doubt, the owner of the scooter recorded in the papers recovered from the accused was one Krishan Lal of Ludhiana, but it is immaterial for the purpose of this case because the possession of the scooter and the opium by the accused is established beyond reasonable doubt from the evidence on the file.[43]

2.6.15 Immediate Dispatch

The prosecution alleged that the accused at the time of his arrest was wearing a shirt and a waist coat which had bloodstains on them. This was a very strong piece of incriminating evidence against the accused. But the investigating officer simply bungled. He should have, the moment he had recovered the alleged bloodstained shirt and waist coat from the accused, sealed them in the presence of witnesses and sent them on to the chemical examiner for analysis. But for a number of days he allowed the shirt and the waist coat to remain with himself.

We have no other alternative than to exclude from consideration the evidence regarding the bloodstains[44].

Another feature of corroboration can be mentioned. Fauja Singh, P.W. 14, who tracker-lifted three footprints from the spot and two footprints at a distance of 12 *kadams* from there, and these were found to be of the *Gurgabis* which had been taken into possession from the feet of Sarbjit Singh and Bahadur Singh. Both Sarbjit Singh and Bahadur Singh were asked to walk on the ground with these shoes and their footprints were also lifted for examination for the expert. Mr. Longia P.W. 12, Assistant Director, Forensic Science Laboratory, Chandigarh, received the moulds and the shoes for examination on 3rd and 6th of November 1967. Five crime moulds and four test moulds were brought to him. The test moulds were in an unsealed condition, these being marked T. 1 to T. 4. The shoes which were also in an unsealed condition were marked section 1 to section 2. These exhibits had been kept too long with the police to impart confidence in the evidence of the expert. What has been frequently said by this court is repeated in *Mohinder Singh v State of Punjab*[45].

That the police should not wait for the recovery of the actual weapon of offence before sending the empty cartridges or bullets, which are found near the scene of occurrence for expert examination. No ground should ever be allowed for the attack by the defence that there was an opportunity for tampering with these empty cartridges while they remained in police custody.

On a parity of reasoning, the same principle should apply in the instant case where there was a long interval between the lifting of moulds and their dispatch to the expert. Whatever value there is of the comparison is lost altogether when we find that the shoes as well as the crime moulds were in an unsealed condition.[46]

2.6.16 Identification Marks[47]

The police should be careful, when sending exhibits to the chemical examiner, to mark each one in such a way that its identity can be fixed and safeguarded throughout, and to specify the

43. *Rameshwar Dass v State of Punjab,* 1975 Cr LJ 1630. Also see *Pritam Singh v State of Punjab,* 1964 Cr LJ 39.
44. *Ali Shan v State of Jammu and Kashmir*, AIR 1954 J&K 42 : 1954 Cr LJ 1124..
45. *Mohinder Singh v State of Punjab,* (l961) 63 Punj LR 434.
46. *Sarabjit Singh v State of Punjab*, 1970 Cr LJ 954 (P&H).
47. *Kala v State of Punjab*, 1948 Cr LJ 660 (Lah).

origin and ownership of each in the covering letter to the chemical examiner. Care should also be taken to see that the evidence tendered in court establishes beyond doubt the origin and ownership of each exhibit sent for examination.

2.6.17 Chain of Custody[48]

In the first place he (the learned counsel for Motia) points out that there is no evidence to show that after the various articles had been recovered from the possession of Motia they were kept sealed so that it was not possible for anyone to sprinkle bloodstains on them while they were in the custody of the police and before they were sent for examination to the chemical examiner. We must point out that this lacuna in the prosecution evidence is there. Whenever it is desired by the prosecution that certain articles, which have been recovered from accused persons, are to be identified, or are to be sent to the chemical examiner for analysis, it is necessary that the officer recovering the articles should immediately take steps to seal them and evidence should be produced that the seals were not tampered with till the identification is over, or till the articles are sent to the chemical examiner for analysis. In the absence of such precautions it would always be open to the accused to say that the police later put human blood on the articles in order to implicate the accused. It is, therefore, necessary for the prosecution to produce evidence that steps were taken at once to seal the articles, and that from the time the articles came into the possession of the police to the time they were sent for identification before a magistrate or for examination to the chemical examiner the seals remained intact. The evidence is missing in the case.

We do not say that this was done in the present case; but as precautions were not taken, the argument raised on behalf of the accused that this might have been done, remains unrefuted. Under the circumstances we cannot place the same reliance on the discovery of bloodstains on these various articles as we would have done if necessary precautions had been taken.

Another point that has been urged is that though it is proved that these articles were recovered from the possession of the accused, and that they are the articles which are before the court, there is no proof that these were the particular articles which were sent to the chemical examiner for examination. We must say again that this lacuna also remains. Evidence should have been produced that these articles recovered from Motia accused were sent to the chemical examiner. All that the letter of the chemical examiner. Ex. M-33 shows that a parcel containing certain things was received by him; but there is nothing to show that these are the very things which were recovered from Motia's possession.

2.6.18 Delay in Dispatch[49]

I would have attached great importance to the evidence of the Imperial Serologist in regard to the detection of bloodstains on the trousers and the shirt, which the appellant was wearing at the time when he was arrested, but I feel impressed by the argument advanced by the learned counsel appearing as *amicus curiae* in this case that the delay in dispatching these articles to the chemical examiner and the absence of the evidence that these articles were sealed and dispatched in the presence of the appellant and respectable witnesses is fatal to the prosecution so far as this point is concerned. These articles were seized from the possession of the appellant on the evidence of 17th Phagan, 2006 at Thana and they were packed, sealed and dispatched to the chemical examiner on 22nd Phagan, *i.e.,* six days after they had remained in the possession of the police. Where is the guarantee that these clothes were not tampered with

48. *State of Rajasthan v Motia*, AIR 1955 Raj 82 : ILR (1953) 3 Raj 655 : 1955 Cr LJ 837.
49. *Abdul Salam v State of Jammu and Kashmir*, 1953 Cr LJ 1587.

during this long interval? In a similar case reported as "1 J&K LR 37 (A)" the learned Chief Justice, the late Mr. Rachhpal Singh J observed as follows at page 42:

> *In a case like this what happens generally is that the police immediately in the presence of witnesses takes possession of the articles containing bloodstains and at once seals them so that it is not open to the accused to come out with the defence that these bloodstains might have been placed there by the police. In the present case the door leaves were for several days in the custody of the police and it is possible that somebody connected with the prosecution might have placed these stains on them.*

Observation is fully applicable to this case. The learned counsel for the appellant has rightly drawn our attention to this glaring defect and I am afraid it would not be correct to exclude the possibility of the stains having been put subsequently on the clothes in this case. As it is, these stains cannot furnish any corroboration of the retracted confession. Apart from it, the appellant had more than 24 hours to wash his clothes and remove the stains. It is not the prosecution story that the idea did not occur to him. On the other hand, the story for the prosecution is that the appellant had washed his *loi,* Ex. P. 3 during the interval. It is, therefore, strange that he should not have washed his shirt and trousers and wandered about with these stains on. Even on this score doubt about the stains having been found on the clothes on the 16th Phagan cannot be altogether eliminated.

2.6.19 Seals on parcels intact[50]

Lastly, Mr. Kartar Singh Raipuri, learned counsel for the respondent argued that no signatory chit of any person was placed in the sealed samples of the opium sent to the chemical examiner and, therefore, it cannot be said that the samples sent were of the opium recovered from the accused. This contention is devoid of force and is repealed. The four sealed samples of the opium recovered from the respondent were deposited by Bant Singh, head constable, P.W. 4, on 4 September 1970, in the malkhana of police station, Sunam, with Ajaib Singh, Moharrir constable with seals intact. On 7 September 1970, Ajaib Singh, Moharrir head constable handed over the four sealed parcels containing samples of the opium with seals intact to Mistri Singh, constable for depositing the same with the chemical examiner, Punjab Government, Patiala. Mistri Singh, constable, took the sealed samples from Ajaib Singh, Moharrir head constable, went to the office of the excise and taxation officer at Sangrur and obtained a letter written in Punjabi from there and then took these four sealed samples to the office of the chemical examiner, Punjab Government, Patiala, and obtained a receipt from there which he handed over to Ajaib Singh, Moharrir head constable.

So long as the sealed parcels of the opium recovered from the respondent remained in possession of Ajaib Singh, Moharrir head constable and Mistri Singh, constable nobody tampered with them. These facts are proved from the affidavits Exhibit PF and PG of Ajaib Singh, *moharrir* head constable and Mistri Singh, constable. The chemical examiner, Punjab Government, Patiala, in his report Exhibit PE, gave the opinion that the contents of all the four samples are opium. He further stated that the seal on each sample was intact and it agreed with the sample seal sent to him. It is thus clear that the samples of the opium recovered from the accused Rameshwar Dass reached the chemical examiner with seals intact.

50. *State of Punjab v Rameshwar Dass*, 1975 Cr LJ 1630 : 1974 Punj LJ (Cri) 383 : 77 Punj LR 189.

CHAPTER 3

FORENSIC SCIENCE IN TRIALS

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Court on Report

It is difficult to see how reliance can be placed on the opinion unless it is supported by good reasons founded on the facts that warranted that opinion. If the reasons are good and convincing, and the factual data on the basis of which the opinion is formed, warrant the opinion, the court will rely on the opinion.

Gujarat High Court

3.1 TRIALS

The trial, in legal parlance, relates to the adjudication process of a dispute in which a person(s) is judged for being responsible for a dispute/conflict/crime. Here the opposing parties come to court, present evidence to support their cases and the court adjudicate the claims of the parties on the bases of the evidence. Trial is a legal formal process. The adjudicator may be a judge and/or a jury. In India, only judges hold the trials without juries. This type of trial is called a Bench Trial. If a jury is also involved, it is Jury Trial. Judge Trials are faster than Jury Trials.

There are appellate courts, which hear an appeal against the verdict of the trial courts. They do not conduct trials.

Modern trials are divided into two categories: criminal trials and civil trials. The former relates to crimes and criminals. Usually, the government is a party to such trials. The latter relates to civil cases usually relating to property, claims and other non-criminal disputes. The Criminal Procedure Code and the Civil Procedure Code regulate criminal and civil trials, respectively.

Criminal trials are of two types: adversarial and inquisitorial trials. In the former, the suspect is accused and the accusing party (usually government) produces evidence to prove the guilt. The accused defends him by producing defence evidence and arguments to negate the incriminating evidence. The judge appraises the evidence from both sides and decides the guilt or innocence of the accused.

In the inquisitorial system, the judge investigates as well as adjudicates the criminal case. He collects evidence, interrogates witnesses and the accused. Both the prosecutor and defence lawyers have a limited role to play in this system.

In India, the adversarial system prevails. Both the parties try to put up such evidence that favours them. Presumption of innocence is fundamental in the system until proved otherwise. The burden of proof lies on the prosecution.

Cross-examination of witnesses is considered the acid test to ascertain the truthful evidence and hallmark of the system.[1] However, moneybags hire loudmouths and *Golu* (liar) witnesses, hoodwink the court and often win the day.

1. *Suleman Usman Memon v State of Gujarat,* AIR 1961 Guj 120 : (1961) 2 Cr LJ 78 (Guj).

In the adversarial system of trials, the burden of proof is on the prosecution. The person facing the trial need not say a single word about the crime, his involvement, or his innocence. The prosecution must prove the case beyond reasonable doubt. The proof often falls short of the *dictum* "beyond reasonable doubt"[2] in the eyes of most of the judges, especially in serious cases. The benefit goes to the accused. Many criminals, thus, are let loose in the society.

The presumed innocence of the accused and "beyond reasonable doubt" in our judicial system, unfortunately, is magnified too much. This reasonable doubt is an uncanny entity and it cannot be delineated/specified in tangible terms. It varies from person (judge) to person (judge). It is responsible for variations in the judicial pronouncements in the same case (appeals upon appeals) or in similar cases, in different courts. That is how we have convicting judges and the acquitting judges. In some High Courts, the clever counsels manipulate to get their cases put up before the non-convicting judges, often leading to miscarriages in the delivery of justice.

It is hoped that scientific proof in trials might decrease the blasphemous abuse of the favourite phrase:

The proof is not beyond a reasonable doubt

"Justice delayed, justice denied" is another serious problem in judicial trials. The cases linger on, sometimes for decades. Under-trials, especially person from the weaker section of the society remains in jails awaiting trial for years. The inadequacy in men and materials in the dissemination of justice is unfortunate. The sanctioned staff strengths are too low everywhere. To add to the misery, a substantial number of posts remains vacant for years. They lack proper selection process and the initial/periodic training. There is no audit/accountability of their working especially on their honesty. Many of the entrants have entered through corrupt means. The government just sleeps over the problems.

Certain court conventions also hinder the delivery of real justice in the trials. They are, therefore, worrisome. They are:

- The eyewitness accounts evidence are the best evidence.
- A thousand culprits may get acquitted but not even one innocent person be punished.
- The benefit of doubt goes to the accused. He gets an acquittal.

3.2 EVIDENCE

The major types of evidence used in a criminal trial are:

1. Eyewitness accounts
2. Confessions
3. Approvers evidence
4. Stock witnesses
5. Circumstantial evidence
6. CCTV evidence
7. Mobile phone evidence
8. Noetic sciences (Brain profiling/fingerprinting evidence/ Psychological Detection of Deception/ Narco-analysis) evidence

2. The phrase is frequently used by the escapist. It is responsible for about 90% of the acquittals in heinous crimes in India.

9. Criminal profiling
10. Surveillance: digital videography, photography, and sound surveillance
11. Evidentiary clues

3.2.1 Eyewitness Accounts

The eyewitness accounts relating to a crime are given by eyewitness(es) victim(s), approver(s) or by the culprit(s) in his confessional statement.

The courts in India depend mostly on the eyewitness accounts. Apparently, the evidence of the eyewitnesses appears to be the best evidence. If a person has witnessed the occurrence, the same should be the best evidence. However, it has been proved, time and again, that this evidence suffers from a number of infirmities:

- The eyewitness observes the occurrence for a short period.
- He may not have observed the complete occurrence.
- He is often uncertain about the identities of the culprits unless he knows them.
- He intermingles the actions of various individuals in the occurrence.
- He is biased in favour of the victim or of the culprit.
- He may be mentally imbalanced. He may exaggerate, using his fertile imagination.
- He may forget, rationalise, or get confused, as his evidence is often recorded after a considerable lapse of time.
- He is subconsciously influenced, by the opinions of other persons with whom he has discussed the case or who have aired their opinions in the media.
- His powers of observation, memory and description may be minimal. He may make up for the shortcoming by perjury make a mess of the crucial evidence.
- He may fear reprisals.
- He may be overawed by the courtroom environment and forget the observations.
- He is bullied by a bulldog of a counsel.
- The culprits may have threatened/scared the witness.
- The opposite party (defence) may have bribed/bought him.

In view of the above, it is highly dangerous and improper to accept the eyewitness accounts as kingpin evidence in its totality or in all cases. Both observations in actual cases and in experiments/research have brought out its fallibility vividly.

Further, urbanisation and individualism have made the availability of eyewitnesses scarce. Fear of retaliation and consumption of time keep the possible eyewitnesses away from his social/moral duty to help maintenance of law and order.

The other non-scientific sources of evidence (confessions, approvers, stock witnesses), as already seen[3] have also failed to deliver real justice.

3.2.2 Scientific Alternative

The scientific tools and techniques of Forensic science, in its varied forms is the only hope to meet the old and the new challenges of crime and classical and new scientific criminals. Forensic analytics has crossed all physical barriers.

3. Chapter 1.

Forensic Science has the capacity to provide needed help. It can do so if the IO knows how the evidentiary clues are correctly located, collected, packed, dispatched, handled and processed, in accordance with the law of the land, so that the court including the defence cannot pick holes in the evidence. He must also know the possibilities and limitations of the given piece of evidence. The scientist has to be academically sound, professionally trained and experienced and above all dedicated to the work. He must not be overloaded with work. He should have the proper equipment and other paraphernalia including supporting staff. Likewise, the counsels and the judges must know the potentialities, limitations, and developments of the science.

3.3 PROBLEMS OF PROOF IN TRIALS

Forensic science can provide flawless proof to link the criminal with the crime beyond reasonable doubt in most of the cases, if its base materials (clues) are properly handled.

The problems of proof are divided into three main categories:

1. Investigative problems
2. Scientific problems
3. Legal problems

3.3.1 Investigative Problems

Scientific evidence can link the criminal with the crime through clue materials. The criminal at the crime scene leaves clue materials at the crime scene, on the victim or on the various articles at the crime scene; or, he picks clue materials from them. If the clue materials are properly collected, preserved, dispatched, got evaluated and their identity, integrity and authenticity remain unquestionable, they can be strong evidence for the proof against the culprit. For example, a fingerprint is found at the crime scene. The suspect has no legal access to the scene. The involvement of the suspect in the crime becomes certain if this fingerprint is identified to be that of the suspect.

This clue material (fingerprint) has to be collected. The collector has to have proper training and expertise, adequate experience for its collection and preservation. If the investigator does not possess adequate knowledge and experience and latest tools, he will not be able to collect the clue materials correctly and the evidence is lost. Unfortunately, the present system of selection, training and to keep them updated in the expertise, is inadequate to meet his requirements.

The crime incidences in our country (as in most other countries) are rising. The increase in the number of investigating officers is not keeping pace with the increasing crime. Consequently, the investigator is not able to give adequate time for the investigation of a case: to locate, to collect, to preserve and get the clue materials evaluated properly. Consequently, valuable evidence is wasted. The distances involved to cover various crimes are also large. The time taken, the cost incurred and the labour inputs are often wasted because by the time the investigator reaches the crime scene, the scene had already been disturbed by the onlookers, curiosity hunters and by the members of the families involved in the incident. The investigator is also not sure of the scientific support or value of the scientific evidence in such circumstances. The uncertainty of the value of the evidence makes him wary to collect even the undisturbed evidence left at the scene that may still be worthwhile.

Theft, mutilation, or destruction of the evidence by culprits or by their sympathisers is not unknown. Sometimes the *corpus delicti* is missing even in the most heinous crimes such as murders and dacoities. The time lag in reaching the scene plays havoc! Authenticity/integrity/identity and relevance of evidentiary clues, collected from the sources, and proved beyond reasonable doubt. The site from which they are collected must be fixed through photographs and sketches.

They are collected in the presence of the witnesses; they are sealed after putting the identification marks on the evidentiary clues whenever possible at the scene. Two independent witnesses should authenticate the collection/packing/sealing of the evidence.

The sealing is done to prevent any substitution, mutilation, destruction, or contamination of the evidence. The evidentiary clues, which are liable to putrefy or disintegrate, are preserved so that the evidence is not destroyed before the experts examine it in the laboratory. If the authenticity of the evidence is not proved beyond reasonable doubt, the courts do not accept the evidence as genuine. It is often suspected to be "padded" evidence. Not only the value of the evidence to link the criminal with the crime is lost but it also casts aspersions on the investigator.

Padding, the induction of fake evidentiary clues, does not pay. Padding is highly unethical. A clever lawyer easily exposes it through clever cross-examination. Once it is exposed, it has an adverse effect on the total evidence in the case. It should never be attempted.

The investigators in general have little faith in the value of the scientific evidence. The following factors contribute towards the fiasco:

- Lack of knowledge
- Inadequate exposure to scientific methods
- Insufficient opportunity for professional dialogue with the scientists
- Improper collection and submission of evidentiary clues

Dialogue between the investigator and the forensic scientists can overcome the uncertainties and bring in better understanding of the value of scientific evidence. Forensic Science Laboratories have come up in most parts of the country. However, the staff strength, the equipment, and other facilities available in these laboratories are inadequate to meet the demands placed upon the scientists in most of these institutions. Besides, the workload is ever increasing. It results in delays and at times inadequate examination. These factors further discourage the Investigating Officer to utilise the evidence.

The general level of education and scientific knowledge is improving in the country. The criminal is increasingly depending upon science and technology to carry out his nefarious work. The investigator on the other hand is too busy in his routine and non-investigative duties. He hardly finds time to update his knowledge and is thus unable to meet the challenges adequately. He continues to depend upon the third-degree methods, which he finds efficacious in the initial stages. Confession from the accused bolsters his confidence. Later retraction of the confession in the trial courts puts the investigating officer in an embarrassing situation. At the stage, however it is too late to collect fresh evidence, which may help him in getting the culprit convicted.

In short investigative problems of proof call for:

- Re-orientation of the training programmes of the investigator.
- Equipping (Investigating Kit!) the investigator to collect and utilise scientific evidence.
- Instilling in him and making him realise the truth that the scientific evidence alone can link the crime and the criminal with certainty, unambiguously and unshakably.
- Frequent collaboration of the scientist with the IO.

Practical investigative problems to which the investigator must pay attention are:

3.3.2 The clue material is relevant

The clue is relevant if it belongs to the case and provides some information about the occurrence, the culprit, his *modus operandi*, victim and the sequence of occurrence, The help of witnesses who certify its collection augments the relevancy.

3.3.3 It is authentic

The clue is authentic if it is proved that it is the same clue, which was left/picked by the culprit, it is the same clue which was collected by the investigator; it is the same clue that was examined in the laboratory, it is the same clue, which is in the court, about which the evidence is being presented. Witnesses of the collection and intact seals (from the scene to the laboratory and to the court) ensure its authenticity.

3.3.4 Its integrity is beyond doubt

The integrity of the clue is beyond doubts; if it is proved that it has not been

- Substituted,
- Contaminated,
- Changed due to natural change or otherwise,
- Mutilated.

It is preserved: no putrefaction, no disintegration, no evaporation, no seepage, and no leakage! The name of the preservative, if used, should always be mentioned.

3.3.5 Its chain of possession is intact

A "Custody" log maintains the chain of possession of the clue material. Its movement/location should be recorded from the time it is taken into possession to the time it is produced in the court. The persons involved, the date and the time should be recorded.

3.3.6 Scientific Problems

The use of science in the dissemination of justice is comparatively new to India. There are many hurdles in its proper utilisation. Some of the important ones are discussed here.

3.3.6.1 Perfect Science

The nonprofessional considers science as something exact and definite. He, therefore, feels that forensic science should always provide a definite answer whenever the question is put to the forensic scientist. The concept of an exact science is hazy among the non-scientists, even among the educated persons, which include lawyers and judges. There is no such thing as an exact science or perfect science. Every new scientific entity starts with an idea. It leads to a hypothesis. If this hypothesis explains and holds good for a number of related phenomena connected to that hypothesis, the hypothesis is called a theory. If there are no apparent contradictions, at least serious contradictions, in the experimental and theoretical results, the idea (hypothesis and theory) receives general acceptance. This general acceptance is reached after a lot of experimental and theoretical work. Before the general acceptance stage, there is a twilight time zone where the idea receives a thorough appraisal and explanations for apparent contradictions. Once the general acceptance stage is reached, the scientific idea is considered a law. However, this law may also be imperfect as its effects and experiments may have been interpreted wrongly. Those who have studied even elementary science must be familiar with the law of conservation of

matter. It was stated that matter could neither be created nor destroyed. The law was held good for a long time and was not only accepted as the perfect law but was proved, time and again, by experiments in the laboratories. However, this law stands shattered when Einstein indicated that matter and energy are inter-convertible. Later on, the inter-convertibility was proved by scientists experimentally. Atom bomb and atomic energy are its dazzling manifestations.

In Forensic Science, also the concept of exact or perfect science is on the same footing as in other sciences.

3.3.6.2 Substantive or Weak Science

There is a general belief that scientific evidence is weak evidence. It is not so. In fact, scientific evidence is real substantive evidence, better than the evidence of the eyewitnesses; because—

- It is objective evidence.
- It is verifiable.
- It is unbiased.
- It is demonstrable.

The misconception that scientific evidence is weak evidence has cropped in because of the improper handling of the scientific evidence in the earlier stages of its induction. Besides, the so-called experts who produced the evidence in the early era were often not qualified experts. Most of them, especially handwriting experts, were only self-proclaimed experts. They did have some qualities: gift of the gab, the presence of mind and the infinite capacity to tell lies and a knack to entice their clients, which kept them in the profession.

The real problem, which causes confusion in the minds of the non-scientists, is the scientific basis on which identifications in forensic science are based, namely; the Law of Probability.

The law determines the chances of occurrence in a particular way out of a number of ways in which an event can occur with equal facility. All identifications, definite or indefinite, even non-identifications, are based on this law of probability. It is a mathematical concept. If the probability is very high, the occurrence of the events in a different way is ruled out for all practical purposes. However, the possibility of non-occurrence cannot be completely ruled out mathematically. For example, the identification of a questioned fingerprint *vis-à-vis* a specimen is based upon finding of numerous common characteristics in the two fingerprints. There may be ten ridge endings, ten ridges bifurcations, six short ridges, two islands and two deltas common in the two prints. If we presume the frequency of occurrence in one person out of ten persons for ridge endings, bifurcations and short ridges and one out of hundred persons for islands and deltas, then the probability of second occurrence of the patterns will be:

$$\mathbf{1/10^{30}}$$

It, in other words, means the chance of occurrence of similar fingerprint in the population is less than one in $\mathbf{10^{30}}$. The chances are infinitesimal that for all practical purposes, it can be taken that the chance of occurrence of a similar pattern in another fingerprint does not exist. The forensic scientists generally believe that if the chances of second occurrence of the event are less than $1/10^{10}$, the occurrence does not take place. They take that **Practical Identity has been achieved**.

Now non-scientists do not understand this concept of practical identity. They feel that the scientist has not given a definite opinion. It is a probable opinion. Forensic science, therefore, is not an exact science.

The confusion perhaps is caused by the fact that non-scientists equate the "**mathematical probability**" to that of "**probability**" used in ordinary parlance, where the word means something probable, but not certain. This concept perhaps led a High Court Judge to ridicule an expert who had based his opinion on probability[4].

3.3.6.3 Presentation of Evidence

Forensic expert evidence is technical in nature. Its improper presentation has hindered its acceptance. The main deficiencies are given without data, without illustrations, without giving its strong/weak points. Some experts side-track even the asked explanations. They do not compile/record the empirical data on which they have based their findings. They use bombastic words and unintelligible theories and jargons to impress the court. Such presentations ensure Waterloo for the evidence. The presentation mode must change. The expert should:

1. Use simple nonprofessional's language. He must avoid bombastic words/jargons/ complicated theories.
2. Use illustrations/graphics/photographs/charts to make the evidence intelligible.
3. Take time to consider/explain the point raised in questions. Instant experts make mistakes/blunders.
4. Be polite.
5. Remain un-rattled on cross-examiner's attempt to rattle him.

Some experienced experts do not record, though they do assess the data, based on their experience. Most of the courts do not appreciate the absence of data. The identifying data make the evidence more respectable/impressive. It helps the courts to appreciate/appraise the evidence better. Besides, it is professionally more satisfying mode.

3.3.6.4 Quality Control

There is no quality control mechanism in generating and presenting forensic evidence, in India, today. It should be part of the system. Regular blind tests at irregular intervals should be the basic rule. Checks for honesty should be part of the system. If there are complaints of dishonesty, covert investigations should ascertain the factum. Quality assurance panel should also check periodically the equipment, the techniques and the data generated by the expert for giving both positive and negative reports.

Quality control involves the following elements:

3.3.6.5 Standardisation

Standardisation of tools and techniques is essential in all scientific work so that the results given by one institution do not differ from the finding of another institution. If tools and techniques are standardised, it should be possible to achieve a sort of uniformity in the scientific examination of clue materials in forensic science. Absolute standardization, however, is not possible for many reasons. *Firstly*, the clue material can be analysed by different tools and techniques. The scientists differ in their selection of tools and techniques. *Secondly*, the advent of new tools and techniques is so fast that their induction in different institutions simultaneously is not administratively feasible or perhaps desirable. Further, rigid standardisation will hamper the introduction of new tools and techniques, innovations and research. Therefore, it should

4. *Bhulakiram Koiri v State of West Bengal,* 1970 Cr LJ 403, 73.

be introduced only in general terms leaving open the scope for continuous developments, innovations and research.

3.3.6.6 Accreditation

Accreditation of the experts and of the institutions is essential to control the menace of dishonest and unqualified experts. It has to be done of course by an authorized body of qualified forensic scientists at the central government level.

3.3.6.7 Miscellaneous

Minor problems relating to scientific proof, include the following: —

- **Are the tools and techniques being used adequate and up to date to generate the data required?**

  There is an unfortunate tendency among the scientists to continue using the same tools and techniques that they adopted in their training, years ago. Newer tools and techniques are often sensitive, specific, and more efficient.

- **Has the expert used modern technology?**

  If not, he should be made to do so.

- **Has the expert followed the standards laid collected/used the requisite data for his report?**

  He should be asked to do so if such standards exist.

- **Are the inferences/conclusions based upon adequate empirical/statistical data?**

  All identifications, as already seen, are based upon extensive statistical data. If it is not broad based it can lead to miscarriage of justice. It is, therefore, essential that the statistical base is checked. In UK, extensive statistical data has been generated for glass, paint and DNA, Similar data has to be generated in our country, if the identifications of the common source are to be reliable.

- **Are photographs or illustrations necessary?**

  Photographs or Illustrations do not help the expert to form an opinion in most of the cases except in UV/IR/X-rays, photography. The expert depends upon the instruments. The illustrations and the photographs, however, facilitate the understanding and presentation of the evidence. The report is based upon data from instrumental observations. Besides, if the expert is dishonest, he can manipulate the evidential illustrations, without the court being aware of the manipulations, nor the court is in a position to check the fraud. If the expert evidence is suspect, the only correct course is to get a second or even third opinion from reputed honest and experienced expert(s).

- **Can judges act as super experts?**

  If so, they have to form an opinion on the evidence of the experts. It is unfortunately absurd. The judge is not an expert on experts. He cannot act as a super expert. If he is not satisfied with the findings of an expert, he should requisition the services of another qualified/experienced/honest/efficient expert.

- **Private experts are a real big problem.**

  They are available for all branches of Forensic Science. Most of them can furnish any report or statement tailored to suit the requirement of the client. The judges

often get puzzled when two experts from the two sides give diametrically opposite reports. They often ignore both or utilise one, which is in line with the other evidence. This often leads to a miscarriage of justice. The judges can, of course, judge the expert whether he is truthful or telling a lie, if they find time and observe his demeanour during his deposition and cross-examination.

3.3.7 Legal Hurdles

The legal problems relating to proof in Forensic evidence involve enacted law, case law and certain court conventions. They have been discussed under the topic Relevant Law/case Law (*infra*). Some practical problems are:

3.3.8 The number of matching points

The number of matching points required for the identification of fingerprints was controversial. The Supreme Court has decided the issue that the rarity of the matching points is important rather than their number, to provide identity[5].

> *Now the question remains as to how many points of similarities can definitely establish the identity beyond question. The Federal Bureau of Investigation of USA requires twelve and the Scotland yards requires sixteen points of similarities for positive identification. However, some English and American authorities are of the view that if there are five or six "well-grouped" characteristics and the patterns uncommon, the identification is definite. By well-grouped characteristics, they mean dots, islands, hooks and spurs. If five or six characteristics occur close to one another and in a narrow area, the force of identity is enhanced. In the case of blurred or partial impressions, the view of some of the Indian authors is that if there are three identical points, they would be sufficient to prove the identity. This has been questioned by other Indian authors who insist on at least six points of similarities to establish the identity. The Finger Prints Bureau of different States in India have fixed varying standards, requiring six to twelve points of similarities to determine the identity. In para 88 of the Finger Print Manual of M.P. State it has been observed: "If a sufficient number of ridge characteristics are in complete agreement in the two impressions it can be said definitely that the impressions were made by the same person. However, no definite rule can be laid down for fixing the number of points of similarities. Four or five might be sufficient if there were unusual peculiarities. The consensus of modern opinion is that six, four in sequence, are sufficient to justify the definite opinion being given.*

3.3.9 Rudimentary Science

The track evidence is believed to be "rudimentary Science" by the courts. They do not place "much reliance" on the evidence. This is most unfortunate. The identification of foot and footwear marks is as reliable as any other identification, though, because of the mechanics of registration of crime evidence it may not provide adequate identification data, as frequently. However, it does not make it rudimentary science in any way. The judgment of a Madhya Pradesh High Court judge is noteworthy in this regard[6].

> *We examined and compared the footprints for ourselves. In our opinion, there is such a remarkable similarity between the admitted footprints of the accused-appellant, Surajpal Singh and the footprints in blood found on the spot that there is a high degree of probability that the footprints in blood found on the floor of the verandah of the accused-appellant, Surajpal Singh are the footprints of the accused-appellant Surajpal Singh.*
>
> *It was, however, unfortunate that it (the development in the identification of track marks) was not brought to the notice of the court that the identification of persons from footprints has*

5. *State of Madhya Pradesh v Sitaram Rajput,* 1978 Cr LJ 1220 (SC).
6. *Surajpalsingh v State of Madhya Pradesh,* 1972 Cr LJ 1668.

many facets and all these facets could not be clubbed together and science of identification from footprints be dubbed as a rudimentary science.

3.3.10 Identification of Handwriting

Identification of handwriting has always required high expertise, vast experience and heavy inputs to come to correct conclusions. Yet the laity feels/believes that if they can identify the handwriting of their kith and kin (which they do day in and day out), they can also identify the handwriting of other persons. When they try, they make mistakes. They blame the science of handwriting identification for its fickle nature. The dissenting opposing experts aggravate the problem further. The courts are wary of accepting handwriting identification evidence. It is unfortunate. They must use the expertise with the help of a reliable expert.

Miscarriages of justice, in handwriting cases occur frequently as in most of the cases judge pass on the onus of judging the evidence to the loudmouth. The courts have to discriminate the charlatans from the genuine expert. Simultaneously, they should change their attitude toward the expertise. It is as good or bad as expertise in other disciplines. The point is brought out vividly in one of the Apex court judgments[7]:

.....But the hazard in accepting the opinion of any expert, handwriting expert or any other kind of expert, is not because experts in general, are unreliable witnesses – the quality of credibility or incredibility being one which an expert shares with all other witnesses, but because all human judgment is fallible and an expert may go wrong because of some defect of observation, some error of premises or honest mistake of conclusion. The more developed and the more perfect a science the less the chance of an incorrect opinion and the converse if the science is less developed and imperfect. The science of identification of fingerprints has attained near perfection and the risk of an incorrect opinion is practically non-existent. On the other hand, the science of identification of handwriting is not nearly so perfect and the risk is, therefore, higher. An expert deposes and not decides. His duty is to furnish the judge with the necessary scientific criteria for testing the accuracy of his conclusion, so as to enable the judge to form his own independent judgment by the application of these criteria to the facts proved in evidence".

We are firmly of the opinion that there is no rule of law, nor any rule of prudence, which has crystallised into a rule of law, that opinion evidence of a handwriting expert must never be acted upon, unless substantially corroborated. But, having due regard to the imperfect nature of the science of identification of handwriting, the approach, as we indicated earlier, should be one of caution. Reasons for the opinion must be carefully probed and examined. All other relevant evidence must be considered. In appropriate cases, corroboration may be sought. In cases where the reasons for the opinion are convincing and there is no reliable evidence throwing a doubt, the uncorroborated testimony of an handwriting expert may be accepted. There cannot be any inflexible rule on a matter which, in the ultimate analysis, is no more than a question of testimonial weight.....

3.4 EXPERT TESTIMONY

Section 45 of the Indian Evidence Act, 1872 and section 293 of the Criminal Procedure Code, 1973 mainly cover the expert evidence. The expert visits the crime scene and help the IO to locate/collect/preserve the evidentiary clues. He examines the clues in his laboratory. He performs the required experiments, makes observations, collects/record the relevant data and draws certain conclusions based on the collected data. He prepares a draft report. He discusses it with his colleagues, removes the lacunae/deficiencies, and prepares a final self-speaking report. It is concise, precise and comprehensive with reasons/photographs/charts, It is intelligible and convincing.

7. *Murarilal v State of Madhya Pradesh,* AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396.

He submits the report to the court through the requisitioning agency. Sometimes the findings are presented in the court personally orally with/without a written report. The written reports of certain specified experts are being accepted as evidence without personal attendance under section 293 of the Criminal Procedure Code, 1973. The list of government officers includes the director, the additional, joint, deputy and the assistant directors of a forensic science laboratory in addition to other government officers[8]. The courts can and do order the personal attendance of the experts when they find it essential.

It has been seen that oral testimony of the eyewitnesses is highly unreliable. Can we depend upon the expert evidence of the scientist? The experts can also be incompetent, corrupt, ill and subject to human errors? Consider the following situations:

1. *A fired cartridge case and the suspected firearm were sent to an "expert". The test cartridge fired by the expert developed high pressure. Consequently, its percussion cap bulged out and got imprinted with a number of marks. The anvil caused a protrusion in the firing pin impression. The "expert" declared non-identity of the common source of the test and crime cartridge.*

   A second expert linked the "crime" cartridge to the suspected firearm! (CH)

2. *A fingerprint expert was once required to give opinion on a disputed fingerprint in the court itself. He used a magnifying lens to study and compare the print with another print. He found ridge patterns and identification characteristics alike. But he was not satisfied with the findings. He requested the court for time to carry out a more detailed examination of the prints under a microscope.*

   The examination revealed the drawn nature of a forged print. (CH)

3. *Once an experienced firearm expert matched the common source of origin of a test and crime bullets (which he had examined under a microscope and taken photographs). When he scrutinised the same in the court at the time of evidence, he was shocked that he had compared and photographed only the test bullets inter se. The expert at once admitted his mistake. He took the crime/test bullets to his laboratory and found that the crime bullet had not been fired from the firearm! (CH)*

4. *Another expert, after a long tiresome journey was immediately taken to the witness box. He identified the source of footwear impression from a particular shoe positively. When his report was shown to him, it indicated only a probability of the impression being from the suspected shoe and not a positive identity! (CH)*

   In some world-famous cases serious mistakes were made:

- *Hitler's handwriting and signatures, in his alleged diaries, were wrongly attributed to him by about half a dozen experts.*
- *Mussolini's fake diaries hoodwinked many handwriting experts.*
- *Dreyfus, a French army officer, was wrongly convicted on the opinion of a self-styled handwriting expert. The miscarriage of justice came to light only years later when the real culprit confessed to the crime.*

Thus, it appears that perhaps expert evidence is unreliable. But it is not so:

- *First*, the subjective factor in expert evidence is very little.
- *Secondly*, it is always verifiable.

If the menace of the corrupt expert is eliminated, the expert testimony can go a long way to assist the dissemination of real justice.

The experts must use the concept of practical identity and familiarise the court and the counsels about the concept. No two entities are exactly alike. There are always some differences.

8. See *The Criminal Procedure Code,* section 293 in the chapter "Relevant Law".

All identifications, therefore, are based on probability. Counsels point out the differences only and plead that the identity is not established. The expert admits the existence of the differences, but he also indicates the preponderance of similarities that establishes practical identity of the common source.

In the presentation of evidence in a court, the prosecution counsel assists the expert. The defence counsel critically appraises him and his evidence. The court makes the final assessment of the evidence. There is no material difference in these aspects even when the expert is produced as a prosecution/defence/court witness.

Corroboration of expert evidence is not legally required as clearly enunciated by the Supreme Court[9]:

> *We are firmly of the opinion that there is no rule of law, nor any rule of prudence, which has crystallised into a rule of law, that opinion evidence of a handwriting expert must never be acted upon, unless substantially corroborated.*

In practice, most of the courts are hesitant to base their convictions, solely on expert testimony, as a matter of abundant caution. However, there are reported cases where the courts convicted the culprit on expert evidence alone. There is no hard and fast rule in this regard. The circumstances of each case determine the weightage to be assigned to the expert evidence.

3.5 THE EXPERT

The chief performer in the presentation of the expert evidence is the expert. He must see that:

1. He is thorough in his examination, has prepared the notes and the illustrations properly, consulted literature and discussed the evidence with his subordinates, colleagues and superiors.
2. He does not allow his imagination to go beyond the realm of observed facts. He does not bluff, does not lose temper, does not hasten with his opinion on incomplete data, and does not have a bias or dishonest intention.
3. He does not propound and maintain complicated and unintelligible theories dogmatically, by using high-sounding words and jargons.
4. He takes sufficient time to consider all the factors and utilises the available sources of information to solve the problem put to him.
5. He has considered the contradictory evidence.
6. His conclusions are clear, unambiguous, definite, and brief. He knows their degree of accuracy or probability.
7. He is conversant with the latest developments in the field.
8. His language is that of a nonprofessional. If technical terms have to be used, they are kept to the minimum and they are fully explained, if necessary, with diagrams, sketches and photographs. If the expert cannot bring the technical evidence to the level of the educated nonprofessional, he is not doing his function properly. The professional experts engaged in forensic science laboratories, fingerprint bureau and handwriting identifications frequently appear in courts. If they are unable to express their findings in ordinary language, they are either incompetent or corrupt. They should be handled accordingly.

9. *Murarilal v State of Madhya Pradesh,* AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396.

I AM FORENSIC EXPERT

1. Academically, I am M Sc (Hons)/Ph. D. in Chemistry.
2. I had training, in Forensics, in UK (New Scotland Yard/other Home Office Laboratories).
3. I handled thousands of crime cases involving use of Forensic Science, over the past few decades and furnished evidence in the courts.
4. I have written about a hundred papers in Forensic Science, published both in India and abroad.
5. I have written over half a dozen books on Forensics, including the present one (VI Ed.).
6. I taught Forensics to one and all: Forensic science students/medico-legal experts/ judges/lawyers/ investigators, bankers and others.
7. I was Honorary Visiting Professor to Panjab University and taught Forensic Science (for decades) as a secondary assignment.
8. I participated in the examinations/reconstructions of many a case involving Forensics.
9. I participated/participate in forensics conferences/meetings/ seminars/workshops.
10. I framed Forensic science academic courses for universities/other teaching Institutions.
11. I was president of Indian Academy of Forensic Science, Kolkata for a few years.
12. I have devoted my whole life (decades), after academic education, to promote forensics.

An expert appearing in the court is "qualified" to start with. The following elements constitute the qualification of the expert:

1. Basic educational qualifications
2. Training; the institute from where the training was obtained, the course contents and the length of the course can give a fair idea of the training.
3. Experience, both in his own field and in the related fields, the number of cases examined both jointly and independently are brought on the record
4. Research work; the papers published and read in the seminars, conferences and meetings are brought on record.
5. Authorship, if the expert has authored books their names and subject matter should be brought on record.
6. Teaching and training programs, if any, conducted by him. They add to the qualifications.

All the above facts are brought on record to show that by education, training and experience the person is specially qualified to express an expert opinion on the subject. The position the expert holds, the length of service, the above record, and the performance help to decide whether the person giving evidence is a qualified expert or not. It is possible to eliminate the imposters at this stage itself.

It must be mentioned that quantitative experience alone is not sufficient. If a person has handled hundreds or thousands of firearms, for a number of years, as a hunter, a gun collector,

a gun dealer or even a gun maker, the experience does not make him a firearm expert for the criminal investigation work. Likewise, a bank clerk does not become a document expert because he handles scores or even hundreds of cheques every day. If a man has some basic scientific knowledge and training in the speciality, he would definitely be a better expert even if he has handled only a few cases. If quantitative experience is added to the qualitative experience, it is prized. This is achieved in the professional forensic science laboratories, where the experts examine the cases relating to his expertise only. Here a high degree of the specialisation is achieved. The experts know the latest developments and contribute to uplift of the profession.

The greatest menace in the expert testimony is the corrupt expert. He, for cash or kind, gives tailor-made opinions! His practices are varied:

- He may tamper with the crime or test exhibits.
- He may suppress the main points of evidence and lays stress on the minor points.
- He may not carry out complete tests and examination.
- He may not produce test exhibits.
- He may not produce proper data, or he may even produce wrong illustrations or data.

It is often difficult for the lawyers and the judges to detect these frauds. However, the judges know the corrupt expert through lawyers. His evidence, therefore, should be accepted with caution. The evidence should rather be got appraised by another expert known to be honest.

The specialists from the universities and other institutes of higher learning are sometimes called to give evidence. They do not appear in the courts often and find it difficult to express themselves in layman's language. However, if they are asked to explain their findings, they do so logically and clarify any apparent deficiencies or ambiguities in clear terms.

3.6 FORENSIC REPORTS IN TRIALS

Hallmarks of a Good Report

1. **It is concise, precise yet comprehensive/intelligible/convincing.**
2. **It is in simple intelligible language. No jargons/unexplained Technical terms/ formulae/ambiguous theories**
3. **It has preponderance of supporting data for its conclusions.**
4. **It explains the contradictory/non-supporting evidence (data).**
5. **It has quality illustrations to support the report.**
6. **It is well reasoned and permits only the given interpretation.**
7. **It is self-contained, self-explanatory, self-testifying.**

3.6.1 Contents of Report

An expert issues report on a standard format (form). The form contains information:

1. The laboratory case number
2. The report number with date
3. The case references (the FIR No. and the Letter No. with dates)

4. The date and mode of the receipt
5. The description of the packages/parcels (with their contents): their number, identification marks on them, seals and the signatures and whether the seals were intact or not and whether the seals tallied with the specimen seal(s).
6. The description of the exhibits, identification marks, signatures or the initials, on them.
7. The Rajasthan High Court[10] has condemned negligence in this regard:

   Another point that has been urged is that though it is proved that these articles were recovered from the possession of the accused, and they are the articles, which are before the court. There is no proof that these were those very particular articles, which were sent to the chemical examiner for examination.
8. The Questionnaire (in brief).
9. The dates on which the examination is commenced and completed
10. The number and nature of the test exhibits prepared.
11. The experiments carried out, the observations made, and the conclusions drawn.
12. The name of the examiner, his qualifications, and his designation.
13. The mode of the dispatch of the report and the exhibits.

The information given in the report has necessarily to be concise but sufficient to be intelligible and to prove the conclusions arrived at convincingly. The expert reports are used/perused by non-experts professionals, usually in the absence of the experts, under section 293 of the Code of Criminal Procedure, 1973, they are, therefore expressed in simple layman's language.

The seasoned experts usually standardise the text of the inference/summary/conclusion of the report. The standardisation increases clarity and obviates chances of misinterpretation. Besides, its frequent use prevents the grammatical mistakes, which are sometimes pointed out in the court, to the great embarrassment of the expert. The conclusion (inference) is highlighted.

The reports should have experimental data, photographs, illustrations, and sketches whenever possible and necessary.

The Gujarat High Court[11] has pointed out:

> *It is difficult to see how any reliance can be placed on the opinion unless it is supported by good reasons founded on the facts, which warrant that opinion. If the reasons are good and convincing and the factual data, on the basis of which the opinion is formed, warrant the opinion, the court will rely on the opinion. However, if the factual data is not clear or adequate or the reasons are frivolous or inconclusive, the opinion will have no probative value. That is the reason why section 51 of the Indian Evidence Act provides that whenever the opinion of any living person is relevant the grounds on which such opinion is based are also relevant.*

10. *State of Rajasthan v Motia,* AIR 1955 Raj 821 : 1955 Cr LJ 835.
11. *Suleman Usnam Menon v State of Gujarat,* (1961) 2 Cr LJ 78.

REPORT GALORE

On LLR (log Likelihood Ratio) odds are calculated in 9 stage:

1. **= Common source: definite positive report**
2. **= Highly probable common source: Highly probable positive report**
3. **= Probable common source: probable positive report**
4. **= Possible common source: Possible positive repot**
5. **= Insufficient common data: No conclusions**
6. **= some different characteristics: Possible negative report.**
7. **= many differing characteristics: Probable negative report**
8. **= Too many differing characteristics: Very probable negative report**
9. **= High preponderance of differing characteristics: definite negative report**

Note: - **Log Likelihood Ratio** (LLR) is a statistical comparison of two entities.

In Forensics the two entities are the supporting and the non-supporting characteristics.

In ordinary classification, the reports/conclusions are classified as under:

- Definite positive or definite negative conclusion,
- Probable (indefinite) positive or probable (indefinite) negative conclusion, or
- No conclusions

The conclusions of the report form the most important part of the reports. A definite report is given only when sufficient evidence is discovered for the linkage or de-linkage. At present, an inconclusive report is given no importance. A decision of Calcutta High Court[12] is relevant on the point:

> *Upon an analysis of the said evidence, we agree with the defence counsel. It is passing strange that an expert in his ultimate opinion would depend upon probabilities and not on the firm conviction. In the absence whereof the said evidence becomes dangerously thin indeed and the court of law would not take that by itself into consideration for fixing the guilt of the accused. The expert having reached the point of interrogation or of probability cannot be relied upon for conviction in a case under section 302 IPC.*

The weightage to be given to a probable on indefinite report varies from one report to another. One report may be inconclusive only technically. In the other, the evidence may be perfunctory, and the data may hardly cross the realm of possibility. Between the two extremes, the probabilities vary. It is the duty of the court to ascertain the value of an inconclusive report. As all identifications, definite or indefinite, are based only on probability figures (estimated or calculated), the court, to exploit the full value of an expert's inconclusive report, should ascertain the probability figures from the expert and use it for corroboration or elimination.

The reports should be sent as soon as possible. The adage "justice delayed, justice denied" is literally true in some cases. All the examinations should be carried out expeditiously and the reports thereof issued promptly. Patna High Court[13] has deplored the delay:

12. *Bhulakiram Koiri v State,* 1970 Cr LJ 403 (Cal).
13. *State of Bihar v Hanuman Koeri,* 1971 Cr LJ 187.

This inordinate delay in the examination by the ballistic expert is to be deplored. It is unfortunate that in such serious cases, the expert does not attach sufficient importance for a speedy examination and a submission of his report.

3.6.2 Illustrations

The expert evidence is technical in nature. The observations are made on the basis of the data collected through instrumental and chemical analyses, The correct idea about these experiments cannot be given by textual description alone. These observations are, therefore, illustrated through photographs, illustrations, and charts for the convenience of the court and the counsels, whenever possible.

The photographs are not necessary for the expert to come to a conclusion in most of the cases. His main forte is data obtained from the comprehensive study of the available/generated data, photographs and other graphics, comparison with standard data and the standards and appraisal of conflicted data. However, to a layperson, the evidence can only be demonstrated through illustrations and photographs. They are presented and explained personally, otherwise, the photographs can mislead and can create confusion.

Andhra Pradesh High Court[14] rejected the evidence, which was not illustrated:

With regard to the pin strike and finer striations on the base of the cap of the cartridge, the opinion expressed is definite and conclusive. But unfortunately he has not produced the test cartridge for comparison purposes. The learned advocate on that account, has argued that the data be supplied or the enlarged photos be produced, so that the opinion of the expert may be verified by the court and the court ought not accept the opinion of the expert without satisfying itself of the correctness of the same.

Learned counsel (for defence) has contended that the record does not furnish the material which has helped the expert in coming to his conclusions in this case and the court has not the advantage of looking into those materials so that to hold that the expert was justified in the opinion he has given. I think the submission must be accepted as correct.

3.6.3 Language

The expert is expected to bring the technical evidence to the level of a nonprofessional. He uses simple and clear language. He avoids technical terms as far as possible, both in the report and in the statement before the court. If he uses technical terms, he explains them.

In a murder trial, it was essential to establish the direction and location of the wounds for the proper reconstruction of the occurrence. The doctor who had carried out the post-mortem examination was not available. The post-mortem report was carefully studied, but it was in such technical jargons that nothing could be made out. A senior medical officer called, too failed to explain the same. (CH)

The Nagpur High Court[15] deprecated Technical verbosity:

I do not minimise the value of expert evidence but I deprecate the attempt to cloud a simple issue in a deluge of scientific words which no ordinary man would be able to understand. The law is grounded on, the assumption that the issues are ones which 'twelve good men and true' can comprehend and answer.

Three types of expert witnesses use technical terminology.

First, the shallow type; they want to impress the court with bombastic words, unintelligible theories, laws and formulas. They feel they impress the court by their use. In addition, they

14. Re *Thimma Reddy v State of Andhra,* 1957 Cr LJ 109.
15. *Basant Rao Baji Rao v State,* 1950 Cr LJ 181 (Ngp).

believe that they succeed in hiding the weaknesses of the evidence and of the case being supported. The courts refuse to be hoodwinked by this technique.

Secondly, the learned types; they know their subject thoroughly, but they are engrossed in their researches and studies. They feel that everybody knows (or should know) what they are talking. This class of specialists does not frequently appear in courts and are, therefore, unaware of the court's requirements. The court and counsel should ask clarification and elucidation of the unintelligible words and phrases in their testimony. The expert will be glad to amplify, though they may feel difficult to express in nonprofessional language.

Third, the corrupt types; They deliberately try to misguide the court through technical words.

The expert should be concise, precise, methodical and his submissions intelligible. Brevity should not be achieved at the cost of clarity.

3.7 THE PROSECUTION COUNSEL

3.7.1 Role

The prosecution counsel role in the trial involving Forensics is to induct technical evidence through an expert. He can do so effectively only if he understands the expert evidence, knows its strong and weak points. He, therefore, holds conference(s) with the expert, to discuss the evidence being produced and its impact on other evidence in the case, prior to putting the expert in the witness box. The counsel helps the expert to present the evidence systematically/logically.

3.7.2 Establish the *bona fide* of the Expert

The presenting counsel (the prosecution counsel in criminal cases) should see that the expert is "qualified". His relevant qualifications: basic educational qualification, training, experience, participation in discussions in professional gatherings, publications, and authorship, if any, of the expert are brought on record. This is essential even if the expert is known to the court. If the expert is well known to the court, it is sufficient to record a summary of his qualifications, so that if at a later stage the case goes to a higher court in appeal, the appellate judge knows that the expert evidence has come from an authentic source[16].

The courts are often easily satisfied as to the *bona fides* of the government experts if they are of a certain status. Even in such cases the status of the expert, qualification, training and extent of experience in the speciality is brought on record as a routine. In case of private experts, one must establish their *bona fides*.

3.7.3 Understand the Evidence

The counsel must understand the evidence. A conference with the expert for this purpose prior to putting him in the witness box is ideal. This is necessary so in heinous cases where it is often essential to determine whether the particular death was a murder, a suicide, an accident or an act of self-defence. Prior understanding will not only avoid sudden surprises in the case for him, but he shall also be able to clarify, amplify and ascertain certain points in the evidence, which may prove useful to the cause of justice.

It is the counsel who is to co-relate and interconnect the expert evidence with other evidence and present to the court an integrated case. He can do so only if:

- He understands the expert evidence.

16. *State of Bihar v Hanuman Koeri,* 1971 Cr LJ 187 (Pat).

- He is able to show that there are no contradictions in the different types of evidence, *inter se.*
- He is able to prove that the various pieces of evidence support one another and lead collectively to one and only conclusion that the accused is guilty.

3.7.4 Induct Demonstrative Testimony Systematically

The counsel ensures that the expert produces the data on which his findings are based. He illustrates the findings by charts, graphs, sketches, diagrams, photographs, and physical reconstruction wherever needed/possible and whenever necessary. He quotes authorities whenever required. The report should be so worded that an intelligent nonprofessional can understand it.

3.7.5 Anticipates the Defence Line

If a case is studied thoroughly, the presenting counsel is able to anticipate the defence line. He should discuss the same with the expert and cover the points, likely to be raised by the defence counsel in the cross-examination. They should be covered in the examination-in-chief itself. He is able to forestall the defence and thus, blunts the edge of the drama, usually enacted by some of the defence counsels.

3.7.6 Handle Inconclusive Report Effectively

An inconclusive report can provide only corroboratory evidence to the linkage chain. If possible, the counsel should get the probative values of the inconclusive reports.

In certain cases, the reports are, as already mentioned, inconclusive only technically. The views of the expert based upon his experience are obtained in such cases. The replies are of great value if the expert has extensive experience in the field and has a reputation for honesty and efficiency.

The inconclusive report sometimes has immense eliminative value. The experts do not often know about these possibilities at the stage of examination. The counsel should know and exploit them intelligently.

3.7.7 Listen to the Cross-examination Attentively

The counsel carrying out the cross-examination may bring forth material, which needs further elucidation or clarifications. He may direct the cross-examination in such a way that creates certain anomalies. It is the duty of the prosecution counsel to take a note of the anomalies and set the record right through re-examination of the expert witness.

3.7.8 Re-examine the expert

Sometimes the cross-examination brings in ambiguities, contradiction and deficiencies in the depositions of the expert. The re-examination clarifies/rectifies those.

3.8 DEFENCE COUNSEL

3.8.1 Role

The defence counsel plays a dramatic role in the induction of the expert evidence. He takes over the expert after the examination-in-chief. An intelligent defence counsel is attentive throughout the examination-in-chief and tries to appraise the evidence produced. He compares the oral evidence

with the written report, a copy of which is supplied to him beforehand, and other relevant data produced by the expert. He plans the cross-examination on his assessment of the situation.

The seasoned counsel does not start cross-examination offhand. If the expert evidence is significant, he takes time to study the report and consult an expert to assist him in the cross-examination. If he feels it necessary after consultation with the expert, he may produce rebuttal evidence.

DEFENCE COUNSEL CHECKS

1. Is the "expert" qualified: education, training, experience, research, publications?
2. Is the "expert" honest: reputation: ill? Demeanour?
3. Is the "expert" an imposter, biased, over-enthusiastic, and/or negligent?
4. Has the "expert" used jargons/verbosity?
5. Has the expert side-tracked the real issues?
6. Is the "expert" conformational Syndrome addict?
7. Does the demeanour of the expert change while answering questions on crucial issues (bungling!)?
8. Has the "expert" co-related the court exhibits with those on which he based his report? How?
9. Is the expert's opinion based on accepted standards? Authorities?
10. Is the expert's evidence convincing? Non-convincing evidence is not acceptable to the court!
11. Has the "expert" distorted photographs and illustrations?
12. Has the "expert" hid the identifying/non-identifying characteristic with indicator lines on the illustrations?
13. Has the "expert" produced adequate data to support his thesis?
14. Has the "expert" shown preponderance of positive/negative evidence to come to corresponding correct conclusion?
15. Has the "expert" discussed/explained contradictory/contrary evidence?
16. Is the expert evidence too technical to permit appreciation? In such a case, he employs an expert to assist in cross-examination.
17. Has the expert hoodwinked the court or bungled? In such a case the defence counsel produces rebuttal evidence.

The defence counsel cross-examines the expert with thought and care. An offhand cross-examination often does more harm than good to the defence case. For proper cross-examination, it is necessary that the counsel:

Understands the evidence. —It is not necessary for him to have studied the subject in a college or a university. But he must acquire sufficient knowledge from the case studies and available standard works recognised and utilised by the courts as authorities. The choice of the right book(s) is, of course, important.

Anticipates the total expert evidence.—As the copy of the expert report is supplied to the defence counsel beforehand he knows what will be the main evidence of the expert. However, often additional evidence and elucidation are sought by the prosecution or by the court at the

time of oral presentation. The defence counsel should be able to anticipate and understand the additional evidence. Otherwise, he should take time to study additional evidence.

Plans his cross-examination carefully.—Ordinarily, the aim of cross-examination is to:

- discredit the *bona fide* of the expert,
- challenge the correctness of his findings, or to
- seek elucidation/additional information, which may clarify, confuse, or contradict other evidence.

The counsel can plan the cross-examination well if he knows the expert, the expertise, the evidence and the details of the case thoroughly.

An impostor in the garb of an expert or the quack expert is exposed by exploring carefully the academic qualifications, the training, the experience, the publications and the research, he or she has claimed. If the expert has claimed the membership or the fellowships of some learned societies, the questions should be directed to know the nature, function and the actual work done by the society and by the expert. For example, some of these personalities add to their names "MFSSI" or "FFSSI", which are supposed to be the membership or fellowship of a defunct society, in India. The impostor often claims degrees or diplomas of non-existing universities and institutes. It should be possible to expose the fraud.

Another class of pseudo-experts is emerging in India. These impostors attend classes organised for police officers, lawyers, and judges to appreciate the scientific evidence. After attending classes, they claim to have acquired the necessary expertise, which such courses do not even pretend to teach.

In addition to the general and the basic education, four variables determine the expertise:

1. The training,
2. The experience,
3. The research, and,
4. The publications

If the credentials of the expert are doubtful, they should be probed.

In **training**, the standing of the institution where the expert obtained his training is important. The detailed nature of the training, the syllabus and the work done during the training should be scrutinised. The length of the training period is important. Some of these impostors have claimed even a short visit (for an hour or two) to an institution as training. Such claims can be easily exposed and should be exposed.

In **experience**, both the qualitative and the quantitative aspects are important. The outstanding cases handled, and the expertise provided by the expert and appraised by the courts and the counsels may also be noted.

In **research**, the subject of research and the journal, with pages, in which the research material is published, are relevant. If possible, the original source (journal) and the reprints of the publication should be obtained and scrutinised.

It is futile to try to discredit a well-established, honest and an efficient expert. It is also criminal to accept an impostor as an expert.

The evaluation of evidence, to challenge the correctness of the findings of an expert, is a difficult and a delicate task. Most of the lawyers prefer to put up another expert for the purpose. It is done in the following ways:

- Special power of attorney is obtained for the defence expert to cross-examine the presenting expert.
- The defence expert is put up on the witness stand for rebuttal.
- A renowned expert is engaged to appraise the report.
- The appraisal report is used in the argument

The services of a reliable expert are not always available. Frequently the counsel has to carry out the cross-examination himself.

It must be remembered that the basic principles of forensic science are simple. Any educated person, who is willing to understand the subject, can do so without any difficulty. Of course, he must have standard books on the subject, the time for their perusal and the will to understand the subject. The study is always rewarding. The incident with Mr. Fallen, a famous American lawyer, may be recalled:

Mr. Fallen, the eminent lawyer, once carried out a brilliant cross-examination of the head of the Gynaecology Department of the Harvard University. At the end of the cross-examination, the professor asked Fallen "May I ask you a question"?

"Certainly", replied the lawyer.

"Where and when did you study Gynaecology, Mr. Fallen"?

"Last night in my library," replied the lawyer.

3.8.2 Defence Counsel's Checklist

The weak points of expert evidence are found from the following checklist:

3.8.3 Did the expert compare the crime exhibits with the test ones?

An expert testified that the crime bullets had been fired from the questioned firearm. The defence counsel knew that the firearm had not been used in the crime. He was, therefore, puzzled at the result. The counsel carefully examined the questioned bullet and the photomicrograph produced by the expert. The crime bullet was deformed to a certain extent, whereas there was no deformation visible on the photograph of the crime bullet. He put up his doubts to the expert. The expert gave a careful check and admitted the possibility of a mistake. He asked for more time, which was readily given.

The re-examination of the exhibits revealed that the expert had by mistake compared two test bullets inter se! (CH)

3.8.4 Does the expert identify the exhibits?

Ordinarily the expert puts his identification marks on the exhibits. The counsels should check the basis of the identification of the exhibits in doubtful cases, as sometimes the exhibits get lost or replaced.

A few years ago, a cartridge case was put up for the identification purposes to the expert in the court. It did not bear the usual initials and the other identifying scribble. The expert was puzzled. However, he had a photograph of the base. He compared the same with the cartridge base. The two did not tally! Later, it was found that the original crime cartridge had been lost and the person responsible for the custody presumably introduced the substitute! (CH)

3.8.5 Has the expert based his opinion on the accepted standards?

The expert should be asked to state the accepted standards of proof of practical identity in the comparison work. The same should be checked beforehand from some standard sources. If

any discrepancy between the two standards is noticed and if the standard of proof of the expert is substantially lower than that given by the authorities on the subject, it should be brought on record. The evidence provided by the expert should then be measured with the yardstick thus laid. In some cases, the evidence would be found below the accepted standards.

It is perhaps relevant to mention in this context that very old books on the subject should not be quoted, as they may be outdated.

3.8.6 Is the evidence produced by the expert convincing?

The illustrations, graphs, charts, photographs, and the data are produced to convince the court and the counsels, in general. If they are not clear and intelligible, they are useless. The point should be pressed by the defence counsel and brought on record. However, the counsel should be familiar with the type of evidence, so that he does not ask any ridiculous questions, thus, exposing his own ignorance. The counsel must convince himself of the correctness or otherwise of the evidence before he stops the cross-examination of the witness.

The defence counsel must have an honest "open mind" approach with the expert evidence. The "closed-door" approach (where the counsel rejects whatever the expert says) does not help. The courts are quick to detect the latter approach. The detection harms the defence case. The court becomes sympathetic towards the expert. The defence counsel earns a bad feeling of the court in the bargain.

3.8.7 Has the expert carried out adequate tests and experiments?

Ordinarily, the expert carries out all the essential spadework. In rare cases only, he may neglect the necessary experiments (due to carelessness, over-work, illness or due to bad intentions). It is often difficult to ascertain the same. A careful scrutiny of the evidence on the part of the defence counsel, with or without the help of an expert, however, may reveal the lacuna.

> ***"General scientific acceptance is a proper condition for taking judicial notice of scientific facts, but it is not a suitable criterion for the admissibility of scientific evidence. Any relevant conclusion supported by a qualified expert witness should be received unless there are distinct reasons for exclusion."***
>
> ***[Rule 702 of the Federal Rules of Evidence, USA]***

3.8.8 Are the exhibits authentic?

It is difficult to ascertain whether the exhibits were safe in the laboratory. However, the expert must certify that:

- He received the exhibits in the sealed conditions.
- The seals were intact and tallied with the specimens supplied separately.
- He opened or got the packets opened in his presence and that he put his identification marks then and there.
- The exhibits during the examination remained in the personal custody (lock and key) of the expert and nobody has or could tamper them.
- He sealed or got the exhibits sealed after the examination.
- The exhibits in the court are the same, which he examined in the laboratory, pertaining to the case in hand.

3.8.9 Is the expert biased?

It is a difficult question to ascertain if the expert is biased. It is generally believed that a government expert is biased in favour of the prosecution and a private expert is biased towards the party employing him. It need not be so. In fact, the circumstances are such that the expert looks biased. The prosecution or the private party puts up an expert in the court only after it has been ascertained that the expert opinion is in their favour. If the opinion is not favourable, the expert is not put up. It is only rarely that the opposite party comes to know about the results and calls the expert as their witness in such cases. The expert is also called now and then by the court, as a court witness.

In one criminal case, the author had given a report, which was neither favourable nor unfavourable to the prosecution. They did not produce the report in the court. At the time of appeal the defence came to know about the existence of the report. The defence insisted upon the production and got the report produced in the court after considerable delay. The Chief Justice who was hearing the appeal had a hearty laugh and remarked, "Much ado about nothing". (CH)

The expert evidence is verifiable. It leaves no room for bias. The question of bias, therefore, has little relevance. In case of doubt, a second expert can be called. It is believed that the two honest experts will agree, almost invariably, to the fundamentals and may differ very slightly in the minor details, if they differ at all.

3.8.10 Additional Details

It is often useful to get helpful additional details. They may contradict the medical evidence or the evidence of the eyewitnesses. Consequently, a doubt may be created in the minds of the court that give its benefit to the accused. Examples:

The investigator allegedly recovered, in a case of murder, a 12 bore shotgun cartridge, made by the Indian Ordnance Factory. It was fired from the suspect weapon of the accused. The defence counsel, at the time of cross-examination, showed to the expert a felt cushion wad that was recovered from the dead body of the victim. The wad never formed part of the cartridges manufactured by the factory. A different manufacturer had been using felt wads in his cartridges! (CH)

2. *In a multi-murder case, the evidence of an eyewitness was believed because he was also allegedly injured in the shooting. The medico-legal expert had X-rayed the injury and taken out foreign material from the injury. On the request of the defence when the exhibits were examined at the time of appeal, no projectile or its fragments were found in the extracted material, nor there was any shadow of a projectile in the X-ray film! (CH)*

CROSS-EXAMINER'S MANTRA

Be mild with the mild; shrewd with the crafty, confiding with the honest, merciful to the young, the frail and the fearful, rough to the ruffian and a thunderbolt to the liar. But never compromise your dignity. Focus fully so that virtue and truth triumphs.

Paul Brown: Harris, 1911

3.9 THE JUDGE

The judge is the ultimate authority to evaluate and utilise the expert evidence. The attitudes of the judges vary tremendously:

- Some judges under-rate expert evidence. They feel that it is weak evidence.

- Some judges are hostile towards the evidence. They feel that the expert assumes the functions of the court.
- Some judges fear expert evidence. They feel they cannot understand the evidence. They either ignore the evidence or accept the *ipse dixit* of the expert.
- Some judges believe that the evidence is not their worry. The counsels should understand and argue about it. The judge should decide the case on their arguments alone.

Such attitudes are undesirable.

The court's scrutiny of expert evidence is necessary:

- The evidence can turn the tables. A suspected criminal may prove to be an innocent person; or, *vice versa*.
- Most of the lawyers, on both sides, feel shy of the evidence. They may fail to properly present or critically appraise the evidence, which may lead to a miscarriage of justice.
- A clever lawyer may exploit the general lack of knowledge to twist the evidence to his advantage and misuse it.
- The prosecution counsel is interested in the prosecution case only. He will expose only those aspects of evidence, which are useful to the prosecution case and goes no farther.
- The defence counsel limits his probes to only those aspects, which are beneficial to the defence case. All his efforts would be to demolish the prosecution evidence.

Thus, only the judge is interested in real justice. He should, therefore, ascertain the facts, assimilate them and utilise them in the dissemination of justice. The newer generation of the judges is aware of their responsibilities in this regard. The expert evidence is likely to play more decisive role in the coming times.

The scientific methods in the detection of the crime are daily improving and are becoming accurate, sensitive, rapid and specific. However, at no stage they are unintelligible. They should be utilized. In brief, the judge must see that:

1. The expert, the prosecution and the defence have done their duties properly, if they have not, the court should intervene at the appropriate time.
2. The expert is honest, properly educated, trained and is engaged in professional work. The court should not permit an impostor to impose upon the court and perjure.
3. The expert does not use meaningless jargons, technical terminology or verbosity to hide the weak points in his evidence or to mislead the court to non-issues.
4. The expert is not forced to answer questions in "yes" or "no". The scientific evidence often needs elaboration. "Yes" or "No" answers, at times, cannot do justice to the truth.
5. The expert has not side-tracked the relevant questions put to him by the counsel or the court.
6. The counsels do not waste time in asking hypothetical questions.
7. The expert evidence produced is relevant, intelligible, properly demonstrated and explained.

8. The points left ambiguous or incomplete, either by the prosecution or by the defence, are clarified through court questions.
9. The inconclusive reports are probed to ascertain their probative values and they are given due weight accordingly. Some reports are inconclusive only technically. They must be given due weight.
10. The data conform to the standards laid down by the concerned professional body.
11. The expert has explained the apparent contradictions satisfactorily.

Judge & the Daubert's Rule (Expert Evidence Scrutiny/acceptability made easy) Judge is the door Keeper to admit only reliable/relevant evidence. He verifies that: The reasons/methodology are valid scientifically. The reasons/methodology are applicable in the case in hand. The theory/techniques used can/have been tested. The standards for the tools/techniques exist. The mechanism to lay/maintain standards exists. The standards maintain/control the processes. The principle/methodology has undergone peer review. The technology used, is generally accepted/used by others professionals in the field. The rate of error is known. The expert explains the improbability of the alternative version of the other party. There are no unjustified extrapolation of established principles/methodology used in the present case. [Daubert's Rule/ standard. 1993: *Daubert v Merrel Dow Pharmaceutical Inc*, 509 US 579 (SC)] (Author's Modified version)

3.10 FALLACIES ABOUT EXPERT EVIDENCE COURTS CONVENTIONS

There are certain court conventions including the following:

3.10.1 "A Court Must Form its Own Opinion"—

"The court must form its own opinion" is a time-honoured convention. It provides a useful check and prevents carelessness and complacency on the part of the expert and other witnesses. The court has to form an opinion on the total evidence including the expert evidence. Some persons feel that the judge must act as a super expert; an expert of experts. The convention does promote this thesis. If he has reservations about the evidence of an expert, a second expert or even a third expert is employed to clear the doubts.

The convention is irksome to some experts. They believe that the expert evidence is too technical to be understood by a nonprofessional (the judge, the lawyer). The belief has no basis. Experience of the author, literally in thousands of cases, indicates that it is always possible to bring the evidence to an understanding level of an educated man provided the man is willing to understand. Some judges and some lawyers, unfortunately, avoid doing so.

The convention ensures that the evidence is descriptive, demonstrative, in non-technical language, logical, intelligible and convincing. If the reports of the expert are considered "*sacrosanct*" and accepted without any scrutiny, the practice will promote miscarriage of justice.

Unfortunately, a few judges misconstrue the convention. They feel that they are expert on experts. They take up the role of the super expert and form their own opinions on technical issues. This is an incorrect approach. The essence of the convention is that the judge should not accept the *ipse dixit* of the expert. He must understand the evidence (with the help of another expert, if necessary) before using it along with the other evidence or rejecting it.

3.10.2 "The Expert must answer in "Yes" or "No""

Some defence counsels want the expert to answer all their questions in "yes" or "no" in the cross-examination. "Yes" or "no" answers, in expert evidence, can be given only at the cost of accuracy and clarity. They are likely to confuse the issues. The court must see that the expert is allowed proper opportunity to amplify and to clarify his testimony whenever he wants to do so.

3.10.3 "The Expert must answer all Questions"

This is also an unfortunate convention with some courts. The expert is a specialist in a very narrow field of his speciality and the knowledge is increasing at such a pace, that it is becoming extremely difficult to keep abreast even in one's own specialisation, what to talk of related fields. The expert is asked only relevant questions pertaining to his report/opinion that he has furnished. If the expert is asked relevant questions relating to the subject matter in hand, the expert must answer all the questions. However, if the counsel is allowed a free rein to indulge in witch-hunting, the expert is often pestered with hypothetical questions, which lead to confusion. Wigmore, an authority on evidence, has remarked:

Hypothetical questions are misused by the clumsy and abused by the clever.
They have in practice led to intolerable obstruction of truth.

3.10.4 "Expert Testimony is Weak Evidence"

Some persons consider expert testimony is subjective, an opinion of the expert. It is incorrect. An expert carries out experiments and makes observations. His conclusions are based upon the observations and they are verifiable. Therefore, the expert testimony is a report of facts. It is not subjective opinion evidence. The courts, which ignore the advances of science, show their own ignorance and the dispensation of real justice suffers. It is evidence of facts, based upon physical evidence. It is free from personal bias and emotions. Above all, it is verifiable.

3.10.5 "Expert Usurps Court's Functions"

An expert does not usurp the judge's functions! He informs the court on one aspect of the evidence only. There are other aspects, of which he may not even be aware. The court takes into consideration the total evidence. It does not decide the case on expert evidence alone in most of the cases. In this connection the words of Rogers, a famous authority on evidence, are worth noting:

> *The proper test of the admissibility of the expert is not whether or not the opinion of the expert would prove the very fact to be found by the jury (court). The object of all testimony is to prove the very fact to be found by the jury and it is not usurpation of powers of the jury to prove that fact.*

3.10.6 "Experts Differ"

The real honest experts do not differ on the basic findings. They may sometimes differ as to the quantum of weightage or to the adequacy of the data for proof. Diametrically opposite opinions are not possible from real and honest experts. One of the differing experts is certainly a corrupt person or at least incompetent.

3.11 TIME ELEMENT

Courts and counsels do not give due importance to the time element. Consequently, the justice delivery system suffers and quite a few cases end in acquittal.

Consider the following cases:

1. *A woman was stabbed at 1 pm. The doctor examined her at 1.45 pm and found the victim in an unconscious state. He found the blood was flowing from the wound "like water from a tap". The bleeding could not be stopped, and no blood transfusion could be given due to lack of facilities. The woman expired at 3 pm.*

   On post-mortem examination the doctor found that the arch of aorta *(the main trunk of the arterial system) was cut and some of the arteries were severed.*

   A dying declaration was allegedly recorded at 2.45 pm. It formed the only important piece of evidence.

   The dying declaration was contested by the defendant on the ground that the victim could not have regained consciousness at 2.45 pm as bleeding continued. Rather, she would have gone deeper into coma with the passage of time.

   The dying declaration could not be believed because of the time element of recording the confession. (CH)

2. *Some years ago, a housewife was taken ill. She was rushed to the hospital and given treatment. She responded to the treatment and was declared out of danger. After a night's rest, she again suffered from the fits and died. The doctor attending upon her declared that the cause of death was complications due to pregnancy.*

   Earlier, her mother had also died with similar symptoms and under similar suspicious circumstances. Some relatives, therefore, suspected foul play and informed the police. A post-mortem examination was carried out and viscera and other body materials were sent to the chemical examiner. The examiner found strychnine poison in the viscera.

   The chemical examiner's report was shown to the doctor who attended upon her. He opined that the poison must have been administered to the victim before she was admitted to the hospital, because after her admission in the hospital, only one nurse was allowed to attend upon her and no visitors were allowed. Before her admission in the hospital she could have taken the poison herself or she could have been given the poison by any of her visitors or relatives. It was, therefore, difficult to fix the identity of the culprit. As the victim had responded to treatment and had been declared out of danger, the investigating officer was not satisfied with the findings of the doctor. He took the medical chart to a toxicologist. The latter, on careful study of the medical chart, came to the conclusion that the victim could not have died of the poison administered to her before her admission to the hospital as probably she had eliminated most of the same and had responded to the treatment. He was certain that the poison was administered to her after she had been admitted to the hospital and declared out of danger.

   The time element fixed by the toxicologist also fixed the possible culprit. There was only one person – the attendant nurse – who was allowed to be with the victim. Prolonged interrogation of the nurse led to the real culprit. He had used the nurse as a tool. The culprit was convicted. (CH)

   In a multi-murder case, the defence alleged concoction and padding by the prosecution. They referred to photographs of the crime scene, which were allegedly taken by the police in the evening. However, the shadows of trees in the photographs indicated morning time. (CH)

It is important that all the investigating officers, the lawyers and the judges should take the time element into consideration to avoid sudden surprises in the cases. They should check and cross-check the presence of the accused, the witnesses, the physical phenomena, and the time of occurrence in a particular case.

3.12 CASE LAW

Supreme Court Cases

(21st Century)

3.12.1 "Rarest or Rare Case"[17]

Author's Summary

It is a landmark judgment in which the Apex Court discussed the Case Law on the subject and provides guidelines to identify the "Rarest of the Rare Cases" and also discussed the situations how to differentiate them from the borderline murder cases.

In this a husband-wife pair killed close relatives for pelf. The Trial Court sentenced them to death. High Court changed the sentence to life imprisonment. SC found the case to be Rarest of the rare cases and sentenced them to death.

Highlights italicised

Relevant Extracts (verbatim)

Having held that both A-1 and A-2 are guilty of the murder of deceased Relu Ram and his family and that their conviction under section 302 read with section 34 and section 120B and other provisions inflicted upon them by both the courts below does not call for any interference by this Court:

> *we now proceed to decide whether the instant case is one of rarest of rare cases warranting death sentence, as has been held by the trial court to be one, or the one in which sentence of life imprisonment would be appropriate, as has been held by the High Court while commuting the sentence of death to life imprisonment.*

Learned counsel appearing on behalf of the accused submitted that the present case cannot be said to be rarest of the rare one so as to justify the imposition of extreme penalty of death. This question has been examined by this Court many times without number. In the case of *Bachan Singh v State of Punjab,* (1980) 2 SCC 684 : AIR 1980 SC 898 : 1980 Cr LJ 636 before a Constitution Bench of this Court, validity of the provision for death penalty was challenged on the ground that the same was violative of Articles 19 and 21 of the Constitution and while repelling the contention, the Court laid down the scope of exercise of power to award death sentence and the meaning of the expression "rarest of the rare" so as to justify extreme penalty of death and considered that clauses (1) and (2) of Article 6 of the International Covenant on Civil and Political Rights to which India has acceded in 1979 do not abolish or prohibit the imposition of death penalty in all circumstances. All that they required is that, *firstly*, death penalty shall not be arbitrarily inflicted; *secondly*, it shall be imposed only for most serious crimes in accordance with a law, which shall not be an *ex post facto* legislation. The Penal Code prescribes death penalty as an alternative punishment only for heinous crimes, which are not more than seven in number. Section 354(3) of the Criminal Procedure Code, 1973 in keeping with the spirit of the International Covenant, has further restricted the area of death penalty. Now according to this changed legislative policy, which is patent on the face of section 354(3), the normal punishment for murder and six other capital offences under the Penal Code, is imprisonment for life (or imprisonment for a term of years) and death penalty is an exception. The present legislative policy discernible from section 235(2) read with section 354(3) is that in fixing the degree of punishment or making the choice of sentence for various offences, including one under section 302, Penal Code, the Court should not confine its consideration "principally" or merely to the circumstances connected with the particular crime, but also give due consideration to the circumstances of the criminal. In many cases, the extremely cruel or beastly manner of the commission of murder is itself a demonstrated index of the depraved character of the perpetrator. And it is only when the culpability assumes the proportion of

17. *Ram Singh v Sonia*, AIR 2007 SC 1218 : AIR 2007 SCW 1278 : 2007 Cr LJ 1642.

extreme depravity that "special reasons" can legitimately be said to exist. Judges should never be bloodthirsty. It is, therefore, imperative to voice the concern that courts, aided by the broad illustrative guidelines indicated, will discharge the onerous function with evermore scrupulous care and humane concern, directed along the highroad of legislative policy outlined in section 354(3), *viz.*, that for persons convicted of murder, life imprisonment is the rule and death sentence an exception.

In the case of *Machhi Singh v State of Punjab,* AIR 1983 SC 957 : 1983 Cr LJ 1457 : (1983) 3 SCC 470, a 3-Judge Bench of this Court following the decision in *Bachan Singh* (supra), observed:

> *that in rarest of rare cases when collective conscience of the community is so shocked that it will expect the holders of the judicial power centre to inflict death penalty irrespective of their personal opinion as regards desirability or otherwise of retaining death penalty. The community may entertain such a sentiment in the following circumstances:*
>
> ***I. When the murder is committed in an extremely brutal, grotesque, diabolical, revolting or dastardly manner so as to arouse intense and extreme indignation of the community. For instance,***
>
> *(i) when the house of the victim is set aflame with the end in view to roast him alive in the house;*
>
> *(ii) when the victim is subjected to inhuman acts of torture or cruelty in order to bring about his or her death; and*
>
> *(iii) when the body of the victim is cut into pieces or his body is dismembered in a fiendish manner.*
>
> ***II. When the murder is committed for a motive which, evinces total depravity and meanness. For instance when***
>
> *(a) hired assassin commits murder for the sake of money or reward; or*
>
> *(b) a cold-blooded murder is committed with a deliberate design in order to inherit property or to gain control over property of a ward or a person under the control of the murderer or vis-a-vis whom the murdered is in a dominating position or in a position of trust; or*
>
> *(c) a murder is committed in the course for the betrayal of the motherland.*
>
> ***III.***
>
> *(a) When murder of a member of a Scheduled Caste or minority community etc., is committed not for personal reasons but in circumstances etc., which arouse social wrath. For instance when such a crime is committed in order to terrorise such persons and frighten them into fleeing from a place or in order to deprive them of, or make them surrender, lands or benefits conferred on them with a view to reverse past injustices and in order to restore the social balance.*
>
> *(b) In cases of 'bride burning" and what are known as 'dowry deaths' or when murder is committed in order to remarry for the sake of extracting dowry once again or to marry another woman on account of infatuation.*
>
> ***IV. When the crime is enormous in proportion. For instance, when multiple murders say of all or almost all the members of a family or a large number of persons of a particular caste, community, or locality, are committed.***
>
> ***V. When the victim of murder is***
>
> *(a) an innocent child who could not have or has not provided even an excuse, much less a provocation, for murder;*
>
> *(b) a helpless woman or a person rendered helpless by old age or infirmity;*
>
> *(c) when the victim is a person vis-a-vis whom the murderer is in a position of domination or trust;*

(d) when the victim is a public figure generally loved and respected by the community for the services rendered by him and the murder is committed for political or similar reasons other than personal reasons.

In the said case, the Court further observed that in this background the guidelines indicated in the case of *Bachan Singh* (supra) will have to be culled out and applied to the facts of each individual case and where the question of imposing death sentence arises, the following proposition emerges from the case of *Bachan Singh* (supra):—

(i) The extreme penalty of death need not be inflicted except in gravest cases of extreme culpability.

(ii) Before opting for the death penalty the circumstances of the 'offender' also require to be taken into consideration along with the circumstances of the 'crime'.

(iii) Life imprisonment is the rule and death sentence is an exception. In other words death sentence must be imposed only when life imprisonment appears to be an altogether inadequate punishment having regard to the relevant circumstances of the crime, and provided, and only provided, the option to impose sentence of imprisonment for life cannot be conscientiously exercised having regard to the nature and circumstances of the crime and all the relevant circumstances.

(iv) A balance-sheet of aggravating and mitigating circumstances has to be drawn up and in doing so the mitigating circumstances have to be accorded full weightage and a just balance has to be struck between the aggravating and the mitigating circumstances before the option is exercised.

The Court thereafter observed that in order to apply these guidelines the following questions may be answered: —

(a) Is there something uncommon about the crime, which renders sentence of imprisonment for life inadequate and calls for a death sentence?

(b) Are the circumstances of the crime such that there is no alternative but to impose death sentence even after according maximum weightage to the mitigating circumstances which speak in favour of the offender?

Ultimately, in the said case of *Machhi Singh* (supra), the Court observed that if upon an overall global view of all the circumstances in the light of the aforesaid proposition and taking into account the answers to the questions posed hereinabove, the circumstances of the case are such that death sentence is warranted, the Court would proceed to do so.

In the light of the law already laid down by this Court referred to above, now this Court is called upon to consider whether the present case would come within the realm of the rarest of the rare or not.

The instant case is one wherein accused Sonia, along with accused Sanjiv [her husband] has not only put an end to the lives of her step-brother and his whole family, which included three tiny tots of 45 days, 2 and a half years and 4 years, but also her own father, mother and sister in a very diabolic manner so as to deprive her father from giving the property to her step-brother and his family. The fact that murders in question were committed in such a diabolic manner while the victims were sleeping, without any provocation whatsoever from the victims' side indicates the cold-blooded and premeditated approach of the accused to cause the death of the victims. The brutality of the act is amplified by the grotesque and revolting manner in which the helpless victims have been murdered which is indicative of the fact that the act was diabolic of most superlative degree in conception and cruel in execution and that both the accused persons are not possessed of the basic humanness and completely lack the psyche or mindset which can be amenable for any reformation. If this act is not revolting or dastardly, it is beyond comprehension as to what other act can be so.

In view of these facts we are of the view that there would be the failure of justice in case death sentence is not awarded in the present case as the same undoubtedly falls within the category of rarest of rare cases and the High Court was not justified in commuting death sentence into life imprisonment. In the result Criminal Appeal No. 142 of 2006 filed by the accused persons is dismissed whereas Criminal Appeal No. 895 of 2005 filed by private prosecutor and Criminal Appeal No. 894 of 2005 filed by the State of Haryana are allowed, order passed by the High Court commuting death sentence into life imprisonment is set aside and order of the trial court awarding death sentence is restored.

3.12.2 Court No Super Expert[18]

Author's Summary

This is an unfortunate situation where the trial court substituted his own opinion for that of medico-legal expert. SC depreciated the substitution:

"opinion is not only unwarranted but also indicative of lack of appreciation of the evidential value to be attached of expert medical evidence".

Highlights italicised

Relevant Extracts (verbatim)

The learned trial Judge in his reasoned judgment has taken the view that there is a fatal flaw in the prosecution case since the medical evidence does not support the case of the prosecution of assault on the deceased by so many persons at the same time in the manner and with the weapons stated. It is pointed out that, P.W. 20 Dr. Sankpal, Medical Officer, Primary Health Centre, Narayangaon who did the post-mortem on the body of deceased stated before the Court that there were in all 26 external injuries on the body of the deceased Namdeo. There were fractures found during the internal examination of the body. The external injuries Nos. 7, 22, 23 and 24 are punctured wounds with lacerated edges and the cause of the death of deceased Namdeo is shock due to rupture of left lung and multiple injuries. The left lung was ruptured apparently due to fractured ribs from 8th to 10th on left side.

The learned trial Judge has noted Dr. Sankpal's opinion that the punctured wounds were caused with hard and blunt object, such as, wooden sticks and iron rods and that Dr. Sankpal has identified the wooden sticks (article No. 44) and iron rod (article No. 42) to be the weapons which could have inflicted the punctured wounds on the body of Namdeo – and logically.

We are constrained to observe that the learned trial Judge was wrong in substituting the expert opinion of the Medical Officer, by his own and, therefore, his findings to the contrary are unjustified and unwarranted.

Dr. Sankpal, P.W. 20 in his deposition before the Court, in para 6 of his evidence, has opined that Injury Nos. 7, 23 and 25 are punctured wounds with lacerated edges. That these injuries could be caused with the rough end of the iron pipe shown to him. He has further stated that the said injuries can be caused with the wooden sticks and iron bar shown to him before the Court. Dr. Sankpal further opined that considering the nature and number of injuries the same must have been caused due to several strokes and the injuries are found to have been caused all over the body from head up to toe. *Nothing has been brought in the*

18. *Gulam Nurmamad Theim v State of Gujarat,* 2002 Cr LR (SC MAH GUJ) Guj 757 : 2002 (3) Guj LR 2642 : 2003 Cr LJ 356 (Guj).

cross-examination of Dr. Sankpal to discredit his expert opinion that the punctured wounds could have been caused with the wooden sticks and iron rod, namely, Articles 44 and 42. In fact, in his cross-examination, Dr. Sankpal has reiterated that the punctured wounds mentioned in column 17 of the notes could have been caused by Articles 42 and 44 and in order to inflict such wounds, those articles must have been thrust with sufficient force in the body. That the punctured wound with its rough and lacerated edges could be caused by edges of Articles 42 and 44.

Thus nothing has been brought in the cross-examination to reject the expert opinion of Dr. Sankpal that the punctured wounds were caused by the thrust of wooden sticks and iron rods and that the several injuries on the body of the deceased must have been caused due to several strokes inflicted by the accused with wooden sticks and iron rods. That the puncture wounds were caused by wooden sticks and iron rods and the severe nature of injuries caused by several strokes all over the body from head up to toe of the deceased resulted in the death of Namdeo due to shock and rupture of left lung and multiple injuries have been established beyond doubt.

The conclusion of the learned trial judge based on his personal opinion in the face of expert opinion is not only unwarranted but also indicative of lack of appreciation of the evidential value to be attached of expert medical evidence.

3.12.3 Expert Evidence[19]

Author's Summary

In this case, SC has provided detailed guideline on Expert Evidence. It has delineated what expert evidence is; who is real expert, what his functions are and what sort of expertise and its mode of presentation should be. It stressed that expert evidence is of advisory character and to courts is to form its own assessment.

Highlights italicised

Relevant Extracts (Verbatim)

The law of evidence is designed to ensure that the court considers only that evidence which will enable it to reach a reliable conclusion. The first and foremost requirement for an expert evidence to be admissible is that it is necessary to hear the expert evidence.

The test is that the matter is outside the knowledge and experience of the layperson. Thus, there is a need to hear an expert opinion where there is a medical issue to be settled. The scientific question involved is assumed to be not within the court's knowledge. Thus, cases where the science involved, is highly specialized and perhaps even esoteric, the central role of expert cannot be disputed. The other requirements for the admissibility of expert evidence are[20]:

(i) that the expert must be within a recognized field of expertise,

(ii) that the evidence must be based on reliable principles, and

(iii) that the expert must be qualified in that discipline.

(12) Section 45 of the Indian Evidence Act speaks of expert evidence. It reads as under:

19. *Ramesh Chandra Aggrawal v Regency Hospital Ltd,* AIR 2010 SC 806 : (2009)9 SCC 709 : (2009) 14 SCR 424.
20. *See* Alan Merry and Alexander Call Smith, *Errors, Medicine and the Law*, 2001 Edn, Cambridge University Press, p 178.

[s 45] Opinions of experts.—When the Court has to form an opinion upon a point of foreign law or of science or art, or as to identity of handwriting [21][or finger-impressions], the opinions upon that point of persons specially skilled in such foreign law, science or art, [22][or in questions as to identity of handwriting] [23][or finger impressions] are relevant facts. Such persons are called experts.

Illustrations

(a) The question is, whether the death of *A* was caused by poison. The opinions of experts as to the symptoms produced by the poison by which *A* is supposed to have died are relevant.

(b) The question is, whether *A*, at the time of doing a certain act, was, by reason of unsoundness of mind, incapable of knowing the nature of the Act, or that he was doing what was either wrong or contrary to law. The opinions of experts upon the question whether the symptoms exhibited by *A* commonly show unsoundness of mind, and whether such unsoundness of mind usually renders persons incapable of knowing the nature of the acts which they do, or knowing that what they do is either wrong or contrary to law, are relevant.

(c) The question is, whether a certain document was written by *A*. Another document is produced which is proved or admitted to have been written by *A*. The opinions of experts on the question whether the two documents were written by the same person or by different persons are relevant.

(13) The importance of the provision has been explained in the case of *State of Himachal Pradesh v Jai Lal,* AIR 1999 SC 3318 : (1999) 7 SCC 280 : 1999 Cr LJ 4294. It is held, that:

> Section 45 of the Evidence Act which makes opinion of experts admissible lays down that when the court has to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting or finger impressions, the opinions upon that point of persons specially skilled in such foreign law, science or art, or in questions as to identity of handwriting, or finger impressions are relevant facts. Therefore, in order to bring the evidence of a witness as that of an expert it has to be shown that he has made a special study of the subject or acquired a special experience therein or in other words that he is skilled and has adequate knowledge of the subject.

(14) It is not the province of the expert to act as Judge or Jury. It is stated in *Titli v Jones*, AIR 1934 All 237 : ILR 56 All 428 that the real function of the expert is to put before the court all the materials; together with reasons which induce him to come to the conclusion, so that the court, although not an expert, may form its own judgment by its own observation of those materials.

(15)

> *An expert is not a witness of fact. His evidence is really of an advisory character. The duty of an expert witness is to furnish the Judge with the necessary scientific criteria for testing the accuracy of the conclusions so as to enable the Judge to form his independent judgment by the application of these criteria to the facts proved by the evidence of the case. The scientific opinion evidence, if intelligible, convincing and tested becomes a factor and often an important factor for consideration along with other evidence of the case. The credibility of such a witness depends*

21. Ins. by Act 5 of 1899, section 3. For discussion in Council as to whether "finger impressions" include "thumb impressions", *see* Gazette of India, 1898, Part VI, p 24.
22. Ins. by Act 18 of 1872, section 4.
23. Ins. by Act 5 of 1899, section 3. For discussion in Council as to whether "finger impressions" include "thumb impressions", *see* Gazette of India, 1898, Part VI, p 24.

> *on the reasons stated in support of his conclusions and the data and material furnished which form the basis of his conclusions.*[24]

(16) In the case of *State of Maharashtra v Damu S/o Gopinath Shinde*, AIR 2000 SC 1691 (1700) : 2000 Cr LJ 2301 : 2000 AIR SCW 1617, it has been laid down that without examining the expert as a witness in Court, no reliance can be placed on opinion alone. In this regard, it has been observed in *The State (Delhi Administration) v Poli Ram,*[25] that:

> no expert would claim today that he could be absolutely sure that his opinion was correct, expert depends to a great extent upon the materials put before him and the nature of question put to him.

(17) In the article "Relevancy of Expert's Opinion" it has been opined that the value of expert opinion rests on the facts on which it is based and his competency for forming a reliable opinion. The evidentiary value of the opinion of expert depends on the facts upon which it is based and also the validity of the process by which the conclusion is reached. Thus the idea that is proposed in its crux means that the importance of opinion is decided on the basis of the credibility of the expert and the relevant facts supporting the opinion so that its accuracy can be cross checked. Therefore, the emphasis has been on the data on basis of which opinion is formed. The same is clear from following inference:

> *Mere assertion without mentioning the data or basis is not evidence, even if it comes from an expert. Where the experts give no real data in support of their options, the evidence even though admissible, may be excluded from consideration as affording no assistance in arriving at the correct value.*

3.12.4 Books as Authorities[26]

Author's Summary

In this murder case, the trial court depended upon books on the subject (authorities) to decide that the murder was by strangulation and not as given by the expert. Both the appellate court ruled that the books cannot take the place of the medico-legal expert who should have been confronted with the authorities, as the circumstances of the case in hand could be different. They reversed the trial court order.

Highlights italicised

Relevant Extracts (Verbatim)

The only circumstance which the trial Court relied upon to hold guilt was by referring to some textbooks on medical jurisprudence. With reference to them, it was held that the case of strangulation was clearly made out.

It cannot be said that the opinions of these authors were given in regard to circumstances exactly similar to those which arose in the case now before us nor is this a satisfactory way of dealing with or disposing of the evidence of an expert, examined in this case unless the passages, which are sought to be relied to discredit his opinion, are put to him.

This Court in *Sunderlal v State of Madhya Pradesh*, AIR 1954 SC 28 : 1954 Cr LJ 257, disapproved of Judges drawing conclusions adverse to the accused by relying upon such passages

24. *Malay Kumar Ganguly v Dr. Sukumar Mukherjee,* AIR 2010 SC 1162 : AIR 2010 SCW 769 : (2009) 9 SCC 221.
25. *The State (Delhi Administration) v Poli Ram,* AIR 1979 SC 14 : (1979) 2 SCC 158 : 1979 Cr LJ 17.
26. *State of Madhya Pradesh v Sanjay Rai,* 2004 Cr LJ 2007 (SC).

in the absence of their being put to medical witnesses. Similar view was expressed in *Bhagwan Das v State of Rajasthan*, AIR 1957 SC 589 : 1957 Cr LJ 889 : 1957 SCJ 515.

Though opinions expressed in textbooks by specialist authors may be of considerable assistance and importance for the Court in arriving at the truth, they cannot always be treated or viewed to be either conclusive or final as to what such author says to deprive even a Court of law to come to an appropriate conclusion of its own on the peculiar facts proved in a given case. In substance, though such views may have persuasive value, they cannot always be considered to be authoritatively binding, even to dispense with the actual proof otherwise reasonably required of the guilt of the accused in a given case. Such opinions cannot be elevated to or placed on a higher pedestal than the opinion of an expert examined in Court and the weight ordinarily to which it may be entitled to or deserves to be given.

Apart from that, even if on the hypothetical basis it is held that doubt could arise on the basis of strangulation, in the absence of any evidence whatsoever to connect the respondent-accused with the act of strangulation, the conclusion of the trial court could not have been maintained and the High Court which is entitled to re-appreciate the evidence could and has rightly discarded it.

3.12.5 Report under section 293 Cr PC Admissible[27]

Author's Summary

It is a simple case of liquor smuggling in which the culprits were convicted. They went in appeal on the plea that testing was delayed, and no expert gave evidence in person. The plea was rejected by all the appellate courts including SC. It remarked that section 293 of CrPC makes the personal attendance of the expert redundant.

Highlights italicised

Relevant Extracts (Verbatim)

Background facts in a nutshell are as follows:

> The appellants were alleged to have been indulging in smuggling of liquor from Haryana to Delhi. The prosecution alleged that upon receipt of information, S.I. Lalit Mohan, along with certain police officials, constituted a raiding party, assembled near a traffic intersection and on 8-4-1994 at about 1.45 A.M. intercepted a Tata 407 vehicle in which the appellants were travelling. Despite being signalled to stop, the vehicle sped away. The police officials chased it, and stopped it and apprehended the appellants. Eighteen cartons containing 12 bottles of "Bonnie Scot" Special Malt Whisky, each being a 750 ml bottle, were recovered. Two sample bottles were taken out separately as samples and (from each carton *i.e.*, 36 bottles). The heads of the samples bottles were enclosed in White Pullanda and sealed with the letters "LMN". Form M-29 was also filled. The seal was handed over to Head Constable Satpal Singh. An FIR was lodged and a site plan was prepared. The appellants were arrayed as accused and arrested. The Excise Control Laboratory opined that the samples submitted tested positive as Whisky." (The appellants were charged with having committed an offence under section 61 of the Punjab Excise Act, 1914 (in short the 'Act'). They stood trial pleading not guilty.
>
> 4. The prosecution examined three witnesses. All of them testified as to recovery of the samples. The accused persons did not lead any evidence in their defence. They

27. *Rajesh Kumar v State (Govt of NCT of Delhi),* (2008) 4 SCC 493 : 2008 (3) Scale 87.

however, denied the accusations through statements under section 313 of the Criminal Procedure Code, 1973 (in short the 'Cr.P.C.')

5. The Metropolitan Magistrate *i.e.*, the trial court by judgment and order dated 1-5-2001 found the appellants guilty and sentenced them to six months simple imprisonment with fine of Rs. 2,000 and in default a further three months simple imprisonment. The appeal preferred by the petitioners to the Additional Sessions Judge was dismissed by order dated 22-2-2006.

6. ***The only stand before the High Court was that there was a delay in dispatch of the sample and none was examined to prove the reports.***

The High Court found that there was no substance in the plea. Referring to the evidence of SI PW 3 and PW 1 about the sealing and sending samples to the Excise Control Laboratory, it was noted that the Form M-29 was filled up by PW-2 at the time of recovery.

All the prosecution witnesses have testified that the same was filled up by PW 3. The seal after use was handed over to PW 1. These were tallied with the specimen seal of M-29 when the Excise Control Laboratory sealed them. It was noted that there was no necessity for examining any witness to prove the Excise Control Laboratory report as documents were marked in terms of section 293 Cr.P.C.

7. Learned counsel for appellants reiterated the submissions made before the High Court. Learned counsel for the respondent, on the other hand, supported the judgment of the High Court. It is submitted that no question was put to either PW-1 or PW-3 on the aspect of alleged delay in sending the samples.

8. Section 293 Cr.P.C. reads as follows:

"293. Reports of certain Government scientific experts.

(1) Any document purporting to be a report under the hand of a Government scientific expert to whom this section applies, upon any matter or thing duly submitted to him for examination or analysis and report in the course of any proceeding under this Code, may be used as evidence in any inquiry, trial or other proceeding under this Code.

(2) The Court may, if it thinks fit, summon and examine any such expert as to the subject-matter of his report.

(3) Where any such expert is summoned by a Court and he is unable to attend personally, he may, unless the Court has expressly directed him to appear personally, depute any responsible officer working with him to attend the Court, if such officer is conversant with the facts of the case and can satisfactorily depose in Court on this behalf.

(4) This section applies to the following Government scientific experts, namely:—

(a) any Chemical Examiner or Assistant Chemical Examiner to Government;

(b) the Chief Controller of Explosives;

(c) the Director of the Finger Print Bureau;

(d) the Director, Haffkeine Institute, Bombay;

(e) the Director [Deputy Director or Assistant Director] of a Central Forensic Science Laboratory or a State Forensic Science Laboratory;

(f) the Serologist to the Government;

(g) any other Government Scientific Expert specified by notification, by Central Government for this purpose.]"

9. A bare reading of sub-sections (1) and (2) of section 293 shows that

it is not obligatory that an expert who furnishes his opinion on the scientific issue of the chemical examination of substance, should be of necessity made to depose in proceedings before Court.

This aspect has been highlighted by this Court in *Ukha Kolhe v State of Maharashtra,* AIR 1963 SC 1531 and *Bhupinder Singh v State of Punjab*, AIR 1988 SC 1011. Therefore, there is no substance in the revision petition so far as the conviction is concerned.

3.12.6 "Rarest or Rare Case"[28]

Author's Summary

A girl from Delhi was inveigled by a rapist for repeated sex on the promise of marrying her. She got pregnant. The rapist wanted her to abort, which she resisted. He ultimately took her in his mother's car, on the pretext of marrying her at Haridwar, to a secluded place and tried to kill her by beating with jack and panna, cut her with blades and throwing acid on her person. Police hearing the shrieks, reached the spot; caught hold of the culprits. There were no eyewitness. However, she was alive when the police reached the scene. She could give the details of the brutalities she suffered. Thereafter she died. The DNA connect of the culprit with the foetus clinched the case against the culprit.

Highlights italicised

Relevant Extracts (Verbatim)

Shorn of unnecessary facts, the case of the prosecution as projected before the trial Court was that on 17-11-2004 Inspector D.N. Verma (PW-1) along with Sub-Inspector Chander Pal Singh (PW-2), Constable Rambir Singh, Constable Sukhram, Constable Ashok Kumar and Driver Yashvir Singh were on patrolling duty; that when they reached ahead of Badsu on Khatoli Road leading towards Falut, they met Constable Rajesh Kumar and another Constable Ramavtar who informed PW-1 and other persons accompanying him that one Indica car took a turn for going towards Falut road and that they heard some screaming noise from that vehicle. PW-1, accompanied by the other personnel referred to above, proceeded towards Falut road and after a distance saw an Indica car. They stated to have seen through the focus light of the police jeep two young men trying to pull out a girl in an injured condition by opening the rear door of the car. It is stated that it was around 2130 hours. The police jeep in which PW-1 and others were proceeding stopped ahead of the Indica car and caught hold of the two young men and also noticed a girl, with injuries all over, on whom acid was also sprinkled. The girl had also sustained injuries on the head as well as on her right cheek. On noticing the above, according to PW-1, when he questioned her, she responded by stating that her name was Jyoti and she is the daughter of one Baljeet Singh, R/o Lane No. 16, House No. 56, Jagatpuri, P.S. Preet Vihar, New Delhi and that her mother's name was Varsha whose cell number was 9871020368. Inspector D.N. Verma (PW-1) stated to have gathered information from her that she developed friendship with the appellant Sandeep while she was working in a mobile shop. She also stated to have revealed that she was pregnant. According to the information gathered from Jyoti, accused Sandeep had called her on that evening and asked her to come to Laxmi Nagar market, Delhi, around 6 p.m. promising her that he will marry her at Haridwar. Believing his words, she went to Laxmi Nagar market from where she was taken in a car and that while they were moving in the vehicle, accused Sandeep asked Jyoti to get the foetus aborted at Meerut, to which she disagreed. On this, he started beating her inside the vehicle right from the point of Modinagar. She stated to have further informed PW-1 and others that she told accused Sandeep that she would reveal all facts to his family members as well as to the police and that when the vehicle in which they were travelling turned towards an isolated place near Khatoli, they tried to throw her into the sugarcane field at which point of time PW-1 and other police members reached the spot. According to her information to PW-1, accused Sandeep and Shashi Bhushan caused the injuries

28. *Sandeep v State of Uttar Pradesh,* (2012) 6 SCC 107 : 2012 (5) Scale 444.

on her with the aid of a jack and pana (spanner), apart from cutting her with a blade and also by pouring acid on her head. PW-1 stated that on noticing the condition of the girl, he arranged for shifting her to Muzaffarnagar Government Hospital in the police jeep along with Constable Rambir Singh and the driver of the jeep. It was further stated that accused Sandeep and Shashi Bhushan, on being apprehended, also revealed their names and informed that accused Sandeep used to visit deceased Jyoti while she was working in a mobile shop in Mayur Vihar Phase-l for the last six months prior to the date of occurrence and developed friendship with her, and that in course of time, deceased Jyoti pressurized him to marry her. On the date of occurrence, around 6 p.m. he stated to have called her over phone to meet him at Laxmi Nagar red light, that she responded to his call and came to Laxmi Nagar red light where accused Sandeep was waiting along with his friend Shashi Bhushan who drove the vehicle Indica car bearing registration No. DL 3 CR 6666 which belonged to his mother.

Accused Sandeep stated to have extended a promise to marry her at Haridwar. While the vehicle started moving, accused Sandeep asked Jyoti to get the foetus aborted to which she did not agree, instead threatened him by saying that she will reveal all facts to his parents as well as to the police and that as they reached Modinagar, he started beating her.

According to the version of accused Sandeep, as told to PW 1, at Modinagar he purchased two bottles of acid and four shaving blades, that when they reached Khatoli, on seeing an isolated place, they tried to pull out the injured Jyoti from the vehicle and that at that point of time they were apprehended by the police. It is the case of the prosecution that while both the accused were taken into custody, the vehicle in which they were travelling was also seized along with the jack and pana, four blades and two acid bottles. The articles, namely, blood stained floor mat, empty bottles of acid, one pair of ladies footwear were stated to have been seized after preparing a seizure memo. A copy of the seizure memo was stated to have been handed over to the accused. It is the specific case of the prosecution that since it was late in the night and it was a lonely place, there were no independent witnesses other than the police personnel. The seizure memo was marked as Exhibit K-1.

Keeping the above respective submissions in mind, when we analyze the case in hand the following facts are indisputable:—

1. *The relationship of Sandeep with deceased, prior to the date of occurrence, namely, 17-11-2004 as his girlfriend;*
2. *The deceased was carrying the foetus of six months old in her womb;*
3. *The Indica car in which the deceased was found on the date and time of occurrence belonged to the mother of accused Sandeep.*
4. *At the time when the deceased was secured by the police on 17-11-2004 at 21.30 hours she was seriously injured but was alive.*
5. *The death of the deceased was ascertained by Dr B.S. Chaudhary (PW-6) at 10.55 p.m.;*
6. *As per the post-mortem certificate, there were as many as 17 injuries which were caused by blunt weapons like jack and pana (spanner), shaving blades and also chemical acid;*
7. *Police witnesses were all on patrol duty on the date of occurrence;*
8. *The DNA test disclosed that accused Sandeep was the biological father of the foetus found in the womb of the deceased;*
9. *The theory propounded by the accused i.e. the car was stolen on 17-11-2004 was not established before the trial court in the manner known to law;*
10. *The statement of the accused as stated to have been made to PW-1 contained various facts unconnected to the crime and also the self-incriminating facts which could be distinguished;*
11. *The absence of any independent witness at the place of occurrence.*

Having regard to the above factors, we are convinced that the case of prosecution that the deceased made a statement about the sequence of the occurrence was really made as spelt out by the witnesses PW Nos. 1 to 5.

When we come to the question of the sentence of death as imposed by learned Sessions Judge, which was also confirmed by the Division Bench as against the accused Sandeep, the same will have to be examined in the light of the principles laid down in the various decisions of this Court.[29] The principle of 'rarest of rare case' enunciated in *Bachan Singh* (supra) has been restated and emphasised time and again in the above referred to decisions. In order to appreciate the principle in a nutshell, what is stated in *Haresh Mohandas Rajput* (supra) can be usefully referred to which reads as under:—

"20. The rarest of rare case" comes when a convict would be a menace and threat to the harmonious and peaceful coexistence of the society. The crime may be heinous or brutal but may not be in the category of "the rarest of the rare case". There must be no reason to believe that the accused cannot be reformed or rehabilitated and that he is likely to continue criminal acts of violence as would constitute a continuing threat to the society. The accused may be a menace to the society and would continue to be so, threatening its peaceful and harmonious coexistence. The manner in which the crime is committed must be such that it may result in intense and extreme indignation of the community and shock the collective conscience of the society. Where an accused does not act on any spur-of-the-moment provocation and indulges himself in a deliberately planned crime and meticulously executes it, the death sentence may be the most appropriate punishment for such a ghastly crime. The death sentence may be warranted where the victims are innocent children and helpless women. Thus, in case the crime is committed in a most cruel and inhuman manner which is an extremely brutal, grotesque diabolical, revolting and dastardly manner, where his act affects the entire moral fibre of the society *e.g.,* crime committed for power of political ambition or indulging in organized criminal activities, death sentence should be awarded."

It is, therefore, well-settled that awarding of life sentence is the rule, death is an exception. The application of the 'rarest of rare case' principle is dependent upon and differs from case to case. However, the principles laid down earlier and restated in the various decisions of this Court referred to above can be broadly stated that in a deliberately planned crime, executed meticulously in a diabolic manner, exhibiting inhuman conduct in a ghastly manner touching the conscience of everyone and thereby disturb the moral fibre of the society would call for imposition of capital punishment in order to ensure that it acts as a deterrent.

Case of the prosecution based on the evidence displayed, confirmed the commission of offence by the appellants, without any iota of doubt, we are of the considered opinion, that still the case does not fall within the four corners of the principle of the 'rarest of the rare case'. However, considering the plight of the hapless young lady, who fell a victim to the avaricious conduct and lust of the appellant Sandeep, the manner in which the life of the deceased was snatched away by causing multiple injuries all over the body with all kinds of weapons, no leniency can be shown to the said appellant. In the decision reported in *Swamy Sharaddananda* (supra) even while setting aside the sentence of death penalty and awarding the life imprisonment, it was explained that in order to serve ends of justice, the appellant therein should not be released from the prison till the end of his life. Likewise, in *Ramraj v State of Chhattisgarh*, AIR 2010 SC 420 : 2010 Cr LJ 2062 : 2010 AIR SCW 23 this Court, while setting aside the death sentence, directed that the appellant therein should serve a minimum period of 20 years including the remissions and would not be released on completion of 14 years of imprisonment.

29. *Bachan Singh v State of Punjab*, AIR 1980 SC 898 : (1980) 2 SCC 684 : 1980 Cr LJ 636; *Machhi Singh v State of Punjab,* AIR 1983 SC 957 : (1983) 3 SCC 470 : 1983 Cr LJ 1457; *Swamy Shraddananda v State of Karnataka*, AIR 2008 SC 3040 : AIR 2008 SCW 5110 : (2008) 13 SCC 767; *Santosh Kumar Satishbushan Bariyar v State of Maharashtra,* AIR 2010 SC (Supp) 612 : AIR 2010 SCW 1130 : (2009) 6 SCC 498; *Mohd. Farooq Abdul Gafur v State of Maharashtra,* AIR 2010 SC (Supp) 884 : (2010) 14 SCC 641 : (2009) 11 Scale 327; *Haresh Mohandas Rajput v State of Maharashtra*, AIR 2011 SC 3681 : AIR 2011 SCW 5414 : (2011) 12 SCC 56; *State of Maharashtra v Goraksha Ambaji Adsul*, AIR 2011 SC 2689 : AIR 2011 SCW 4208 : 2011 Cr LJ 4286.

66. Therefore, in the evidence of PW 10, Junior Scientific Officer of the Central Forensic Laboratory, Chandigarh, it was brought out that the blood samples of accused Sandeep and the foetus received by him on 27-1-2005 and that necessary test was conducted based on which a report on 13-B/1, 13-A/2 and 13-C/3 was forwarded which confirmed that the accused Sandeep was the biological father of the foetus. He also confirmed in the cross-examination that the earlier sample of the foetus preserved in formalin solution received on 5-1-2005 was returned back without opening the seal as the same was kept in formalin solution and standard protocol analysis was not available in the laboratory. He further confirmed that when the sample on second time was received along with the letter dated 25-1-2005, the same was preserved in ice separately which they were able to test in their laboratory for finding out the result. It has also come in his evidence that the collection of samples, preservation of samples and transportation of samples if not carefully done, it may affect the result, but in the case on hand the result reported by him was not based on wrong facts.

67. In the light of the said expert evidence of the Junior Scientific Officer it is too late in the day for the appellant Sandeep to contend that improper preservation of the foetus would have resulted in a wrong report to the effect that the accused Sandeep was found to be the biological father of the foetus received from the deceased Jyoti. As the said submission is not supported by any relevant material on record and as the appellant was not able to substantiate the said argument with any other supporting material, we do not find any substance in the said submission. The circumstance, namely, the report of the DNA in having concluded that accused Sandeep was the biological father of the recovered foetus of Jyoti was one other relevant circumstance to prove the guilt of the said accused.

> 75. Taking note of the above decision and also taking into account the facts and circumstances of the case on hand, while holding that the imposition of death sentence to the accused Sandeep was not warranted and while awarding life imprisonment, we hold that accused Sandeep must serve a minimum of 30 years in jail without remissions before consideration of his case for premature release.

3.12.7 Court No Super Expert[30]

Author's Summary

This is an unfortunate situation where the trial court substituted his own opinion for that of medico-legal expert. SC depreciated the substitution:

"opinion is not only unwarranted but also indicative of lack of appreciation of the evidential value to be attached of expert medical evidence".

Highlights italicised

Relevant Extracts (Verbatim)

The learned-trial Judge in his reasoned judgment has taken the view that there is a fatal flaw in the prosecution case since the medical evidence does not support the case of the prosecution of assault on the deceased by so many persons at the same time in the manner and with the weapons stated. It is pointed out that, P.W. 20 Dr. Sankpal, Medical Officer, Primary Health Centre, Narayangaon who did the post-mortem on the body of deceased stated before the Court that there were in all 26 external injuries on the body of the deceased Namdeo. There were fractures found during the internal examination of the body. The external injuries Nos. 7, 22, 23 and 24 are punctured wounds with lacerated edges and the cause of the death of deceased Namdeo is shock due to rupture of the left

30. *Gulam Nurmamad Theim v State of Gujarat,* 2002 Cr LR (SC MAH GUJ) Guj 757 : 2002 (3) Guj LR 2642 : 2003 Cr LJ 356 (Guj).

lung and multiple injuries. The left lung was ruptured apparently due to fractured ribs from 8th to 10th on left side.

The learned trial Judge has noted Dr. Sankpal's opinion that the punctured wounds were caused with hard and blunt object, such as, wooden sticks and iron rods and that Dr. Sankpal has identified the wooden sticks (article No. 44) and iron rod (article No. 42) to be the weapons which could have inflicted the punctured wounds on the body of Namdeo – and logically.

We are constrained to observe that the learned trial Judge was wrong in substituting the expert opinion of the Medical Officer, by his own and, therefore, his findings to the contrary are unjustified and unwarranted.

Dr. Sankpal, P.W. 20 in his deposition before the Court, in para 6 of his evidence, has opined that Injury Nos. 7, 23 and 25 are punctured wounds with lacerated edges. That these injuries could be caused with the rough end of the iron pipe shown to him. He has further stated that the said injuries can be caused with the wooden sticks and iron bar shown to him before the Court. Dr. Sankpal further opined that considering the nature and number of injuries the same must have been caused due to several strokes and the injuries are found to have been caused all over the body from head up to toe. *Nothing has been brought in the cross-examination of Dr. Sankpal to discredit his expert opinion that the punctured wounds could have been caused with the wooden sticks and iron rod, namely, Articles 44 and 42. In fact, in his cross-examination, Dr. Sankpal has reiterated that the punctured wounds mentioned in column 17 of the notes could have been caused by Articles 42 and 44 and in order to inflict such wounds, those articles must have been thrust with sufficient force in the body. That the punctured wound with its rough and lacerated edges could be caused by edges of Articles 42 and 44.*

Thus nothing has been brought in the cross-examination to reject the expert opinion of Dr. Sankpal that the punctured wounds were caused by the thrust of wooden sticks and iron rods and that the several injuries on the body of the deceased must have been caused due to several strokes inflicted by the accused with wooden sticks and iron rods. That the puncture wounds were caused by wooden sticks and iron rods and the severe nature of injuries caused by several strokes all over the body from head up to toe of the deceased resulted in the death of Namdeo due to shock and rupture of left lung and multiple injuries has been established beyond doubt.

The conclusion of the learned trial judge based on his personal opinion in the face of expert opinion is not only unwarranted but also indicative of lack of appreciation of the evidential value to be attached of expert medical evidence.

3.12.8 Benefit of Doubt[31]

Author's Summary

About 90 % criminals committing heinous crime are given benefit of doubt and acquitted, making mockery of the criminal justice. Proof beyond reasonable doubt is a guideline, not a fetish. A fair doubt is based upon reason and common sense. It must grow out of the evidence. The SC, in this case, has quoted chapter and verse from case law that exaggerated devotion to the rule of benefit of doubt must not nurture fanciful doubts or lingering suspicion and thereby destroy social defence.

It is a case of drug trafficking where the traffickers wanted to get the benefit of doubt.

Highlights italicised

31. *Iqbal Moosa Patel v State of Gujarat*, AIR 2011 SC (Supp) 470 : (2011) 2 SCC 198.

Relevant Extracts (Verbatim)

The facts giving rise to the conviction and sentence of the appellants have been set out in detail by the High Court in the order under appeal hence need not be detailed over again except to the extent it is absolutely necessary to do so. Briefly stated the prosecution case is that a certain secret information was received by Mr. K.C. Chudasma, Inspector, Anti-Terrorist Squad which was passed on to Mr. P.S. Tomar, Zonal Director, Narcotics Control Bureau, Ahmedabad. The information suggested that Accused No. 2 Mr. Hemaram Chaudhary was the kingpin of a syndicate involved in smuggling and interstate trafficking of narcotic substances. Accused No. 3 Shri Derajram Jat was the man allegedly carrying out the operations at the instance of the said Mr. Hemaram Chaudhary. The information so received was used to intercept and search a truck bearing registration number RJ-04-G-1305 on 29th June, 2001 at Lal Bahadur Shastri Bridge, Pirana area in the city of Ahmedabad while the same was returning from Bharuch. The truck was driven by accused No. 4-Ashuram Durgaram Choudhary while accused No. 3 Derajram Jat was accompanying him. The search of the truck led to the seizure of psychotropic drugs from the aforesaid two persons who revealed that the consignment in question had been supplied by Mr. Hemaram Choudhary-accused No. 2.

On the basis of the information so collected and the disclosure made by the driver of the truck and Derajram Jat-accused No. 3. Appellant-lqbal Moosa Patel was taken into custody and his statement under section 67 of the NDPS Act recorded. A raid was then carried out on 7th July, 2001 at village Varadia, Khadaki Street, District Bharuch, which led to the seizure of heroin weighing 3.056 kgs. and cash of Rs. 1,17,500 from the residence of appellant No. 1 Iqbal Moosa Patel. In his statement recorded under section 67 of the N.D.P.S. Act the said accused admitted having purchased four packets of brown sugar from one Master and Bhaikhanbhai both residents of Badmer in Rajasthan in the month of March, 2001, out of which one packet had already been sold to one Shakur while the remaining three were seized by the respondent from his residence as mentioned above.

On the basis of the material placed before the trial court the accused persons were charged with different offences to which the accused pleaded not guilty and claimed a trial.

13. That brings us to the question whether the appellants could be given the benefit of doubt having regard to the nature of the evidence adduced by the prosecution against them. We do not think that the appellants have made out a case for grant of any such benefit.

It is true that the prosecution is required to establish its case beyond a reasonable doubt, but that does not mean that the degree of proof must be beyond a shadow of doubt. The principle as to what degree of proof is required is stated by Lord Denning in his inimitable style in *Miller v Minister of Pensions*, (1947) 2 All ER 272 : 177 LT 536 : 63 TLR 474:

That degree is well-settled. It need not reach certainty, but it must carry a high degree of probability. Proof beyond reasonable doubt does not mean proof beyond a shadow of a doubt. The law would fail to protect the community if it permitted fanciful possibilities to deflect the course of justice. If the evidence is so strong against a man as to leave only a remote possibility in his favour which can be dismissed with sentence of course, it is possible but not in the least probable,' the case is proved beyond reasonable doubt....

It is true that under our existing jurisprudence in a criminal matter, we have to proceed with the presumption of innocence, but at the same time, that presumption is to be judged on the basis of conceptions of a reasonable prudent man. Smelling doubts for the sake of giving benefit of doubt is not the law of the land."

14. *Reference may also be made to the decision of this Court in Sucha Singh v State of Punjab,* (2003) 7 SCC 64 : AIR 2003 SC 3617 : 2003 AIR SCW 3984*, where this Court has reiterated the principle in the following words:*

".....Exaggerated devotion to the rule of benefit of doubt must not nurture fanciful doubts or lingering suspicion and thereby destroy the social defence. Justice cannot be made sterile on the plea that it is better to let a hundred guilty escape than punish an innocent Letting

the guilty escape is not doing justice according to law. [See Gurbachan Singh *v* Satpal Singh, AIR 1990 SC 209 : 1990 Cr LJ 562 : JT 1989 (4) SC 38].

Prosecution is not required to meet any and every hypothesis put forward by the accused. A reasonable doubt is not an imaginary, trivial or merely possible doubt, but a fair doubt based upon reason and common sense. It must grow out of the evidence in the case. If a case is proved perfectly, it is argued that it is artificial; if a case has some flaws inevitable because human beings are prone to err, it is argued that it is too imperfect. One wonders whether in the meticulous hypersensitivity to eliminate a rare innocent from being punished, many guilty persons must be allowed to escape.

Proof beyond reasonable doubt is a guideline, not a fetish."

3.12.9 Expert v Ocular Evidence[32]

Author's Summary

It is a case of murder where the IO and the Medico-legal doctor showed extreme degree of dereliction of duty. The IO lost the material evidence. The doctor refused to record injuries on the person of the deceased. SC felt that the dereliction of duties was deliberate. They discarded his evidence.

The eyewitness evidence was reliable and sufficient. They convicted the culprit and wrote to government to take action against the derelicts.

Highlights italicised

Relevant Extracts (Verbatim)

In the presence of panchas, including Balwant Singh, PW8, he noticed that there were three injuries on the person of the deceased, Pyara Singh and prepared Inquest Report *vide* Ex. Ka-6 recording his opinion that the deceased died on account of the injuries found on his body. After preparing the site plan, Ext. Ka-10, he also wrote a letter to the Superintendent, Civil Hospital, Haldwani for post-mortem, being Exhibit Ka-9. The dead body was taken to the said hospital by Constable Chandrapal Singh, PW 7. Dr. C.N. Tewari, PW-3, medical officer in the Civil Hospital, Haldwani, performed the post-mortem upon the body of the deceased and did not find any ante-mortem or post-mortem injuries on the dead body. On internal examination, he did not find any injuries and could not ascertain the cause of death. Further, he preserved the viscera and gave the post-mortem report, Exhibit Ka-4. After noticing that there was no injury or abnormality found upon external and internal examination of the dead body, the doctor in his report recorded as under:

"Viscera in sealed jars handed over to the accompanying Constables.

Jar No. 1 sample preservative saline water.

Jar No. 2 Pieces of stomach

Jar No. 3 Pieces of liver, spleen and kidney.

Death occurred about one day back.

Cause of death could not be ascertained. Hence, viscera preserved.

It appears from the record that the deceased's viscera, which allegedly was handed over by doctor to the police, was either never sent to the Forensic Science Laboratory (for short, the 'FSL') for chemical examination, or if sent, the report thereof was neither called for nor proved before the Court. In fact, this has been left to the imagination of the Court.

32. *Dayal Singh v State of Uttaranchal,* AIR 2012 SC 3046 : (2012) 8 SCC 263 : 2012 Cr LJ 4323.

Considering the ocular and other evidence produced by the prosecution, the learned trial court *vide* its judgment of conviction and order of sentence, both dated 29 June 1990, found the accused persons guilty of offences under section 302 read with section 34 IPC as well as under section 323 read with section 34, Indian Penal Code. The Trial Court, while dealing with the arguments of the accused for application of section 34, as well as the submission that the witnesses had not attributed specific role to the respective accused persons, held as under:

> The attack was premeditated and the accused had come fully prepared to do the overt act. The injury was caused on the head of the deceased which is a vital part of the body at which it was aimed by employing lathi, it was clear that the accused persons had intended to cause death by giving a blow on vital part of the body of the deceased. After receiving the injuries, the deceased fell down and even thereafter he was attacked by the accused persons and he died on the spot immediately. The expert witness is expected to put before the Court all materials inclusive of the data which induced him to come to the conclusion and enlighten the court on the technical aspect of the case by examining the terms of science, so that the court, although not an expert, may form its own judgment on those materials after giving due regard to the expert's opinion, because once the expert opinion is accepted, it is not the opinion of the medical officer but that of the Court. [See *Madan Gopal Kakkad v Naval Dubey*, (1992) 2 SCR 921 : (1992) 3 SCC 204 : 1992 AIR SCW 1480].

31. Profitably, reference to the value of an expert in the eye of law can be assimilated as follows:

> *The essential principle governing expert evidence is that the expert is not only to provide reasons to support his opinion but the result should be directly demonstrable. The court is not to surrender its own judgment to that of the expert or delegate its authority to a third party, but should assess his evidence like any other evidence. If the report of an expert is slipshod, inadequate or cryptic and the information of similarities or dissimilarities is not available in his report and his evidence in the case, then his opinion is of no use. It is required of an expert whether a government expert or private, if he expects, his opinion to be accepted to put before the court the material which induces him to come to his conclusion so that the court though not an expert, may form its own judgment on that material. If the expert in his evidence as a witness does not place the whole lot of similarities or dissimilarities,, which influence his mind to lead him to a particular conclusion which he states in the court then he fails in his duty to take the court into confidence. The court is not to believe the* ipse dixit *of an expert. Indeed the value of the expert evidence consists mainly on the ability of the witness by reason of his special training and experience to point out the court such important facts as it otherwise might fail to observe and in so doing the court is enabled to exercise its own view or judgment respecting the cogency of reasons and the consequent value of the conclusions formed thereon. The opinion is required to be presented in a convenient manner and the reasons for a conclusion based on certain visible evidence, properly placed before the Court. In other words the value of expert evidence depends largely on the cogency of reasons on which it is based.*

[See: BR Sharm, *Forensic Science in Criminal Investigation & Trial,* 4th Edn]

38. The purpose of expert testimony is to provide the trier of fact with useful, relevant information. The overwhelming majority rule in the United States, is that an expert need not be a member of a learned profession. Rather, experts in the United States have a wide range of credentials and testify regarding a tremendous variety of subjects based on their skills, training, education or experience. The role of the expert is to apply or supply specialized, valuable knowledge that lay jurors would not be expected to possess. An expert may present the information in a manner that would be unacceptable with an ordinary witness. The common law tried to strike a balance between the benefits and dangers of expert testimony by allowing expert testimony to be admitted only if the testimony were particularly important to aiding the trier of fact. Even in United States, if the helpfulness of expert testimony is substantially outweighed by the risk of unfair prejudice, confusion or waste of time, then the testimony should be excluded under the relevant Rules, and State equally balanced. Expert testimony on any issue of fact and significance of its application

has been doubted by the scholars in the United States. Even under the law prevalent in that country, the opinion of an expert has to be scientific, specific and experience based. Conflict in expert opinions is a well prevalent practice there. The skill and experience of an expert is the ethos of his opinion, which itself should be reasoned and convicting. Not to say that no purview would be possible, but if the view of the expert has to find due weightage in the mind of the Court, it has to be well authorised and convincing.

Dr. C.N. Tewari was expected to prepare the post-mortem report with appropriate reasoning and not leave everything to the imagination of the Court. He created a serious doubt as to the very cause of death of the deceased. His report apparently shows an absence of skill and experience and was, in fact, a deliberate attempt to disguise the investigation.

We really need not reiterate various judgments, which have taken the view that the purpose of an expert opinion is primarily to assist the Court in arriving at a final conclusion. Such report is not binding upon the Court. The Court is expected to analyse the report, read it in conjunction with the other evidence on record and then form its final opinion as to whether such report is worthy of reliance or not. Just to illustrate this point of view, in a given case, there may be two diametrically contradictory opinions of handwriting experts and both the opinions may be well reasoned. In such case, the Court has to critically examine the basis, reasoning, approach and experience of the expert to come to a conclusion as to which of the two reports can be safely relied upon by the Court.

The assistance and value of an expert opinion is indisputable, but there can be reports which are, ex facie, incorrect or deliberately so distorted as to render the entire prosecution case unbelievable. But if such eyewitnesses and other prosecution evidence are trustworthy, have credence and are consistent with the eye version given by the eye-witnesses, the Court will be well within its jurisdiction to discard the expert opinion. An expert report, duly proved, has its evidentiary value but such appreciation has to be within the limitations prescribed and with careful examination by the Court. A complete contradiction or inconsistency between the medical evidence and the ocular evidence on the one hand and the statement of the prosecution witnesses between themselves on the other, may result in seriously denting the case of the prosecution in its entirety but not otherwise[33].

3.13 ADDITIONAL CASE LAW

3.13.1 Expert Evidence[34]

The essential principle governing expert evidence is that the expert is not only to provide reasons to support his opinion, but the result should be directly demonstrable. The court is not to surrender its own judgment to that of the expert or delegate its authority to a third party, but should assess his evidence like any other evidence. If the report of an expert is slipshod, inadequate or cryptic and the information of similarities or dissimilarities is not available in his report and his evidence in the case, then his opinion is of no use. It is required of an expert whether a government expert or private, if he expects, his opinion to be accepted to put before the court the material which induces him to come to his conclusion so that the court though not an expert, may form its own judgment on that material. If the expert in his evidence as a witness does not place the whole lot of similarities or dissimilarities,, which influence his mind to lead him to a particular conclusion which he states in the court then he fails in his duty to take the court into confidence. The court is not to believe the *ipse dixit* of an expert. Indeed the value of the expert evidence consists mainly on the ability of the witness by reason of his special training and experience to point out the court such important facts as it otherwise might fail to observe and in so doing the

33. *Madan Gopal Kakkad v Naval Dubey*, AIR 1992 SCW 1480 : (1992) 3 SCC 204 : (1992) 2 SCR 921.
34. *Chunni Lal v State of Haryana*, 1977 Cr LJ (Notes) HC.

court is enabled to exercise its own view or judgment respecting the cogency of reasons and the consequent value of the conclusions formed thereon. The opinion is required to be presented in a convenient manner and the reasons for a conclusion based on certain visible evidence, properly placed before the court. In other words, the value of expert evidence depends largely on the cogency of reasons on which it is based.

3.13.2 Court Appearance[35]

When an expert is summoned it is not incumbent that he himself should appear. Any officer who is working with him conversant with the facts of the case and can satisfactorily depose in court can be deputed on his behalf. In the instant case the appellate judge wrongly refused to act upon reports and evidence of the chemical examiner on the ground that he did not himself conduct the analysis *Mangaldas Raghavji Ruparel v State of Maharashtra*, AIR 1966 SC 128 : (1965) 2 SCWR 581 : 1966 Cr LJ 106 (SC), *Relied on.*

3.13.3 Data necessary[36]

In the case of *Ramkaran Singh v Emperor,*[37] it was held that no doubt excise inspector was an expert in his own department and was able to distinguish liquors but the court should under section 51 ascertain the grounds on which his opinion was based so as to test it.

In this case the conviction was based on the bald statement of the excise inspector that the stuff which was recovered from the possession of the accused was illicit liquor but no data was furnished for the opinion. It was held that there was no adequate proof that the liquor was illicit.

The conviction was therefore set aside.

In *Mst Titli v Alfred Robert Jones:*[38]

> it was held that the opinion of an expert by itself may be relevant but would carry little weight with a court unless it was supported by a clear statement of what he noticed and on what he based his opinion. It was further held that the expert should, if he wanted his opinion to be accepted, put before the court all the materials which induced him to come to a conclusion so that the court although not expert might form its own judgment on those materials.

In view of the above decisions I am of the opinion that the bald statement of the excise inspector without examining the contents that it was illicit liquor, is not sufficient to prove the fact.

3.13.4 Test Cartridge not produced[39]

So far as the pellets are concerned, the results arrived at by the firearms expert do not appear to be conclusive.

They only seem to bear the impress of a mere probability, though with regard to the pin strike and finer striations on the base or the cap of the cartridge the opinion expressed seems to be definite and conclusive. But, unfortunately, he has not produced the test cartridge for comparison purposes. The learned advocate on that account has argued that unless the data be supplied or the enlarged photos be produced so that the opinion of the expert may be verified

35. Re *State of Kerala,* 1978 Cr LJ (NOC) 73.
36. *Gobardhan v State of Uttar Pradesh*, AIR 1959 All 53 : 1956 All WR (HC) 216 : 1959 Cr LJ 13 (All).
37. *Ramkaran Singh v Emperor,* AIR 1935 Ngp 13 : (1935) 36 Cr LJ 511.
38. *Mst Titli v Alfred Robert Jones,* AIR 1934 All 273.
39. Re *Kodur Thimma Reddi,* AIR 1957 AP 758 : (1957) 2 Andh WR 156 : 1957 Cr LJ 1091 (AP).

by the court, the court ought not to accept the opinion of the expert without satisfying itself of the correctness of the same.

3.13.5 Data/evidence about Sanity/Insanity Essential[40]

Dr. Roy's evidence is, to my mind, useless, and so far as I am concerned, it is suspicious from the start. His anxiety to be examined as a court witness and not as one for the defence, which he in fact was, at once indicates his bias or high anxiety to pose as a disinterested scientist.

That apart, a medical witness who considers it unnecessary to examine a person, however sane at the moment, for suspected lunacy, is not of much value. In this case Dr. Roy has attempted to substitute his judgment for that of the court. The question whether in the given circumstances a man was sane or insane is for the court to decide. An expert can only furnish a court with data from which insanity can be inferred. It is beside the point whether in the opinion of the doctor the man was medically insane. Even that would be a dangerous conclusion on the slender data on which Dr. Roy proceeded; but, however, that maybe, what we have to decide is whether the man was legally insane and there, at bottom, the question is a simple and common sense one which ordinary Jurors can easily comprehend.

3.13.6 Admissibility of Opinion on Data[41]

When an expert is to depose on a particular point, it is the duty of the expert to state in clear terms the basis or foundation or the data on which he concludes his findings. The court is competent to consider his opinion along with the data and has definitely a jurisdiction to consider as to whether the conclusion or the opinion should be accepted or not.

3.13.7 Language of Expert[42]

The criticism that the expert lives in and speaks from an impregnable fortress hardly holds good today. Experts are always ready to explain the reasons for their opinions; and judges are entitled to attach little or no importance to their evidence if the explanations given are not satisfying.

3.13.8 Expert's Language[43]

I do not minimize the value of expert evidence in these cases (of alleged insanity) but I deprecate the attempt to cloud a simple issue in a deluge of scientific words which no ordinary man would be able to understand. Even though cases of this type are tried without a jury in this province, the law is grounded on the assumption that the issue are ones which "twelve good men and true" can comprehend and answer.

3.13.9 Expert Reports[44]

It is next urged by the petitioner's counsel that the Exhibit P-5 the chemical examiner's report, does not contain any data or particulars which are necessary to help the court in accepting the opinion; it merely states that the bottle contained alcoholic content 21.912%. v/v at 60°F.

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40. *Baswantrao Bajirao v Emperor*, AIR 1949 Ngp 66 : 1950 Cr LJ 181 (Ngp).
41. *Suriya Kanta Sarkar v State of Assam*, 1977 Cr LJ 268.
42. Re *SA Sattar Khan*, AIR 1939 Mad 283 : 40 Cr LJ 483 : 1938 Mad WN 962.
43. *Baswantrao Bajirao v Emperor*, AIR 1949 Ngp 66 : 1950 Cr LJ 181 (Ngp).
44. *Mahadevayya Veerabhadrayya Hiremath v State of Mysore,* AIR 1966 Mys 75 : 1966 Cr LJ 270.
    Also see *State of Himachal Pradesh v Shiv Devi*, AIR 1959 HP 3 : 1959 Cr LJ 448; *Suleman Usman Memon v State of Gujarat*, (1961) 2 Cr LJ 78.

The petitioner has relied on *Prabhu Babaji Navle v State of Bombay.*[45] In that decision their Lordships have held that it is chemical examiner's duty to indicate the number and extent of bloodstains found on the clothes sent to him for examination. In my opinion, this decision is not of any assistance to the petitioner. That was a case of bloodstains found on the clothes of the accused person and not a case concerning the report sent by the chemical examiner of the analysis of the percentage of alcohol contained in the article sent to him for examination. Further it may be noted that their Lordships did not say that because of the defects pointed out by them, the chemical examiner's report not given a detailed description is inadmissible. In *Suleman Usman Memon v State of Gujarat*[46] it has been held that the report of the chemical examiner must show the tests or experiments performed by him, the factual data revealed by such tests or experiments and the results leading to the formation of the opinion from such factual data; otherwise, the report would have no value as a piece of evidence.

This judgment of a single judge has not been approved by a Bench decision in *State of Maharashtra v Ramsingh Desasingh,*[47] Chainani, CJ, speaking for the Bench has stated:

> *The court cannot refuse to consider the evidence furnished by a certificate of the chemical examiner or assistant chemical examiner issued under section 129A of the Bombay Prohibition Act, 1949, merely because it does not mention the data on the basis of which the chemical examiner arrived at the percentage of alcohol mentioned in his certificate, or because he has not given the reasons for his conclusion. If the court feels that it should have more information in order to satisfy itself about the correctness or otherwise of the certificate, the court should summon the chemical analyser or ask the prosecution to summon and examine him. But without examining the chemical analyser, the court would not be justified in holding that the charge against the accused has not been proved, merely because the certificate issued by the chemical analyser only mentions the percentage of alcohol found in the blood of the accused and does not give any other particulars.*

With regard to the question of delay in the examination of the bottle, this is not a question of law which could be agitated before this court in a revision petition. The offence was committed on 14 July 1962 and the bottle was immediately seized and sealed in the presence of *panchas*. The same was sent to the chemical examiner on 27 July 1962. The fact that the report of the chemical examiner was received long after this, does not in any way affect the value of the report of the chemical examiner.

3.13.10 Reports Admissible[48]

Learned Counsel for the respondent has taken this technical objection that none from the office of the Chemical Examiner came forward to depose or file an affidavit to show that the sample of opium had not been tampered with during the period it remained with the Chemical Examiner. The respondent did not take a positive stand at the stage of the recording of the evidence that there had been any interpolation in the office of the Chemical Examiner in relation to the sample which was examined. It was only urged at the stage of the hearing of the arguments that it was the duty of the prosecution to show by leading some kind of evidence that the sample of opium had not been tampered with in the office of the Chemical Examiner. The trial court took into consideration this fact that no official of the Chemical Examiner was interested in tampering with the sample and that all official acts done by a public servant in the discharge of his duties could be presumed to be validly done. It was mentioned by Constable Gurnam Singh P.W. 3 in his affidavit that he had left the sample of opium in the office of

45. *Prabhu Babaji Navle v State of Bombay,* AIR 1956 SC 51 : 1956 Cr LJ 147.
46. *Suleman Usman Memon v State of Gujarat*, AIR 1961 Guj 120 : (1961) 2 Cr LJ 78 (Guj).
47. *State of Maharashtra v Ramsingh Desasingh,* AIR 1963 Bom 68 : ILR 1962 Bom 493 : (1963) 1 Cr LJ 567.
48. *State of Punjab v Nachhattar Singh*, 1982 Cr LJ 1197.

the Chemical Examiner. The learned Counsel for the respondent laid stress on this point that it should have been entrusted to the Chemical Examiner himself. The trial court took into consideration this fact that it was not possible for the Chemical Examiner to personally receive the samples sent to him in all types of cases.

In the report, exhibit PE, of the Chemical Examiner it was specifically mentioned that the seal on the exhibit was intact and agreed with the sample seal sent. That means that up to the time the sample was examined there had been no interference in the same. The argument of the learned counsel for the respondent before us is that the report of the Chemical Examiner is admissible only for showing the sample to be one of opium and that any further observation made by him with regard to the condition of the sample at the time of the examination cannot be received in evidence under the provisions of section 293 Cr PC. The learned counsel has obtained support for his argument from a Single Bench ruling of this court,[49] wherein the scope of section 510 of the old Code of Criminal Procedure which corresponds to section 293 of the new Code was considered. The following quotation from the head note itself would clarify the view taken in that case:

> Held, *that according to the provisions of section 510, Cr PC., it is only the report of the Chemical Examiner upon any matter or thing duly submitted to him for examination, that can be used as evidence. In other words, it is the report by which is implied the opinion of the Chemical Examiner, which can be used as evidence provided the matter or thing, in respect of which such opinion is sought has been duly submitted to him for examination. In the context, the word "report" refers to the report proper pertaining to the examination of the matter or thing forwarded to him and not to any incidental intimation noted or endorsed in that report. section 510, Cr PC. dispenses with the necessity of production of Chemical Examiner as a witness in court to prove the contents of his report pertaining to the examination. It does not dispense with necessity of proof of any other incidental or consequential matter, about which a note has been appended in that report.*

We respectfully differ from the above view. Section 293 of the Cr PC. lays down that any document purporting to be a report under the hand of a Government scientific expert to whom this section applies, upon any matter or thing duly submitted to him for examination or analysis and report in the course of any proceeding under this Code, may be used as evidence in any inquiry, trial or other proceeding under this Code. The use of the word 'document' can lead to this inference that not only the opinion of the Chemical Examiner but all that is stated in the report becomes admissible without formal proof. If this were not so, such practical difficulties would arise as would render the examination of the Chemical Examiner or somebody from his office a dire necessity, and not only the position of the seal but even reference numbers of the communications received from the police would have to be proved by examining some witness so as to connect the material examined with the one sent for examination. The view taken in *Santa Singh's* case (*supra*) is, therefore, overruled.

Several Single Bench rulings of this court were then referred to by the learned Counsel for the respondent for showing that it was imperative for the prosecution to lead evidence about the non-tampering of the sample in case it had been entrusted by the police authorities to some functionary other than Chemical Examiner himself. The particulars of these rulings are as follows: —

(1) *Tehal Singh v State of Punjab*[50] decided by Tewatia, J on 20 November 1980.

(2) *Gurcharan Singh v State of Punjab*[51] decided on 5 February 1981, by Tewatia, J.

49. *Santa Singh v State*, (1970) 72 Punj LR 618.
50. Cri Rev No. 219 of 1979.
51. Cri Rev No. 304 of 1979.

(3) *Amarjit Singh v State of Punjab*,[52] decided by Punchi, J.

(4) *Atma Singh v State of Punjab*[53] decided by Punchi. J.

(5) *Bishan v State of Punjab*[54] decided by Dewan, J.

The ratio in *State of Rajasthan v Daulat Ram,*[55] was taken into consideration for giving this finding that unless somebody from the office of the Chemical Examiner filed an affidavit showing that the sample of an article remained in the same state as it had been handed over by the police till its actual examination, the link evidence would not be taken to be complete. In that case samples of opium were taken from the Excise Headquarters and were then handed over to a Sub-Inspector of a certain police station. Thereafter another witness had handed over the samples to the Superintendent of Police, Jodhpur, for onward transmission to the Public Analyst, but the samples were not accepted by the office of the Superintendent of Police as the labels were not in order. Then follows the following (Para 1): —

> It is the admitted case of the prosecution that the samples changed several hands before reaching the public Analyst. In other words, the samples remained in the custody of SI Aidanram, PS Udai Mandir, Nathu Singh, Gujraj Singh, Jawan Singh and the Assistant Public Analyst and yet none of these witnesses were examined by the prosecution to prove that while in their custody the seals were not tampered with. The inevitable effect of this omission is that the prosecution failed to rule out the possibility of the sample being changed or tampered with during this period—fact which had to be proved affirmatively by the prosecution. This is the main infirmity which has been relied upon by the High Court in holding that the prosecution has not proved that right from the stage of the seizure of the opium up to the time when the samples were handed over to the Public Analyst the seals remained intact.

Thus, the dictum in *Daulat Ram's* case enjoins upon the prosecution to prove this fact that up to the stage the sample reaches the Public Analyst the police not tampered with the same – so to substitute the article which was contained in the original sample. The seal used by the police is ordinarily handed over to a person of their choice and hence, it is not difficult for them to obtain back the seal and use it over again. The courts, therefore, always insist that somebody should come forward to depose that there has been no tampering of the seal until the sample gets out of the reach of the police authorities. We are of the view that the ratio of *Daulat Ram's* case cannot by analogy be applied to the employees working in the office of the Chemical Examiner. Those employees are not at all interested in the success of the prosecution case. It could only be the person who has been prosecuted for the recovery of some incriminating article who would be interested in the substitution of any material that was to be examined. Any mischief on the part of such a person would be sufficiently guarded against by obtaining this report of the Chemical Examiner that the seals were intact till the contents of the sample had been examined by him. If the courts were to insist that in every case all those persons who handled the sample in the office of the Chemical Examiner should depose about this fact that the sample had not been tampered with till it was opened for examination, it would very nearly render nugatory the beneficial provisions contained in section 293 of the Cr PC. The insistence upon obtaining depositions of the employees of the Chemical Examiner's office would prolong trials without any useful purpose being served. As pointed out by the trial court, it would not be possible to entrust all the samples to the Chemical Examiner himself for keeping them in safe custody till their examination. We are thus against extending the ratio of *Daulat Ram's* case beyond its actual scope. The report of the Chemical Examiner to this

52. 1981 Chand Cr Cas 170 (P&H).
53. 1981 Chand Cr Cas 181 (P&H).
54. 1981 Chand Cri C 243 : 1982 Cr LJ (NOC) 22.
55. AIR 1980 SC 1314 : (1980) 3 SCC 303 : 1980 Cr LJ 929.

effect that the seals on the sample were intact when it was examined by him is considered by us to be a sufficient safeguard against any mischief that could be perpetrated in the office of the Chemical Examiner.[1]

3.13.11 Insufficient Evidence[56]

The next question which is in the context of these discoveries arises is whether in the circumstances of this case Kanhiya can be held guilty for the murder of Smt. Dhooli and her son Shyoji? The investigating agency could not discover the *corpus delicti* nor is there any evidence on the record to show that both Smt. Dhooli and her son Shyoji dies between 6th and 9 March 1972. The prosecution did not take care to bring on record any fact that the bones and pieces of clothes seized near the river either belonged to or could be that of Smt. Dhooli and her son Shyoji. In the absence of any material on record it is difficult to hold that Smt. Dhooli and Shyoji have died. In the view of the matter the charge under section 302, IPC for committing murder of Smt. Dhooli and Shyoji cannot be sustained.

3.13.12 No Identification marks[57]

Certain gold biscuits were seized from an accused. A goldsmith tested the biscuits and certified that they were of 24 carats purity. He was, however, unable to assert by way of identification marks, seal, that the biscuits tested by him were the same which were seized from the accused.

Held, the prosecution failed to establish that the biscuits seized from the accused were of gold so as to attract the provisions of section 123 of the Customs Act and section 85(iii) of the Gold (Control) Act.[3]

3.13.13 Prosecution Failure[58]

It seems to us that the evidence which has been adduced falls short of proof in regard to a very material part of the prosecution case. In a case where death is due to injuries or wounds caused by a lethal weapon, it has always been considered to be the duty of the prosecution to prove by expert evidence that it was likely or at least possible for the injuries to have been caused with the alleged weapon. It is elementary that where the prosecution has a definite or positive case, it must prove the whole of the case.[4]

3.13.14 Nature of weapon Uncertain[59]

It is no doubt true that the medical evidence is that such wounds could be caused by an axe and knife. But it is unfortunate that no question has been put to the expert as to whether the weapons exhibited in the case as material objects could cause the wounds as found on the body of the deceased.

I am not prepared to believe that a clean and flawless truncation could be effected with the knife alleged to have been recovered from the appellant.

It is difficult to say with certainty or high probability that such wounds would be caused by an axe.

56. *Kanhiya v State of Rajasthan*, 1976 Cr LJ 1652 : 1976 WLN 160 : 1976 Raj LW 251.
57. *Govt of India v Mohammed Issak*, 1980 Cr LJ (NOC) 37.
58. *Mohinder Singh v State of Punjab*, AIR 1953 SC 415 : 1953 Cr LJ 1761 (SC).
59. *Bhagoji v Hyderabad Govt,* AIR 1954 Hyd 196 : 1954 Cr LJ 1378 : ILR 1954 Hyd 130.

3.13.15 Prosecution Failure[60]

It was elicited, however, from the doctor in cross-examination that the fatal injury in question (on the neck) could have been caused by fist blows. After this statement it was incumbent upon the counsel for the prosecution, and, if he failed to do so, on the Sessions Judge, to question the doctor further as to whether it was possible for the fist blows to have caused strangulation. It is very unlikely that they should have, but as the point was not clarified, the matter is left in doubt. This is not the only circumstance showing the unsatisfactory nature of the trial before the Sessions Judge, for there was no question put to the doctor as to the number of fist blows which in his opinion could have caused the said fatal injury.

3.13.16 Counter-complaints[61]

In a complaint and counter-complaint such as this obviously arising out of the same transaction, when the prosecution proceeds on the basis of the complaint, we think, it is the duty of the prosecution to exhibit the counter-complaint through the police officer who recorded it and also to prove medical certificates of persons wounded on the opposite side also and place before the court a definite case which they ask it to accent.

3.13.17 Duties of the Defence[62]

Following with respect the decision reported I hold that the absence of data in Ex. P-5 does not make it inadmissible in evidence. It was open to the petitioner, if he wanted to have some more details or particulars about the report, to request the court to summon the chemical examiner for cross-examination. The petitioner has not done so and he cannot now contend that the report has no evidentiary value.

3.13.18 Failure of The Defence[63]

It was argued for the appellants that the pellet said to have been recovered by Dr. Singh from the injury No. 4 of Ram Singh had not been produced as a material exhibit and in the absence of such evidence it was doubtful if any pellet had really been extracted from his body. There is no doubt that the pellet was not produced by the doctor or by the prosecution in this case as a material exhibit. Dr. Singh was not asked about it, or he might have given some explanation as to what happened to it and whether he forwarded it to the police or not. In view of the fact the doctor or the prosecution witnesses were not cross-examined on this point and had no opportunity of explaining as to why it was not produced in the lower court, its mere non-production does not affect the case.

It was also argued that it was very unlikely that the pistol injury would have produced a four-sided or four-cornered wound and that, if really a pistol was used, then it would be expected that a round wound would be made because a pellet was round. There is nothing on record to show whether the pellet was round or square and whether it had four corners or not. If the doctor were cross-examined and were asked on this point, he might have been able to give some explanation as to how the four-sided or four-cornered wound was made by the pistol shot.

60. *Dissu v State of Himachal Pradesh*, AIR 1953 HP : 1953 Cr LJ 84.
61. Re *Boya Gajji Pedda Venkatanna*, 1953 Cr LJ 1898 : ILR 1952 Mad 562 : (1952) 1 Mad LJ 244 (Mad).
62. *Mahadevayya Veerabhadrayya Hiremath v State of Mysore,* AIR 1966 Mys 75 : 1966 Cr LJ 270.
63. *Nardeo Singh v State of Uttar Pradesh,* AIR 1953 All 726 : 1953 All LJ 408 : 1953 Cr LJ 1677 (All).

3.13.19 The Duties of Court[64]

We find that, although doctors who performed the post-mortem examination and who had admitted Hari Singh into the hospital, were examined at the trial, no question was put by either side to elucidate whether the contents of the small intestine and the large intestine could remain in that condition. The post-mortem examination took place at 2.40 pm on 13 December 1969, and the intestines were then found distended with gas. We do not know whether this could be their condition at 1 pm on 12 December 1969 or its effect. It is precisely questions of this kind which, even the prosecution or the defence counsel omits to put them, the trial court could and should have put to the doctors to clear up the position. If the trial court had failed to consider their importance, the High Court could have and should have taken further evidence on this matter under section 540 Code of Criminal Procedure. In a criminal case, the fate of (the proceeding cannot always be left entirely in the hands of the parties. The court has also a duty to see that essential questions are not so far as reasonably possible left unanswered. We are surprised to find, from the judgment of the High Court that the questions mentioned above, arising out of the post-mortem report, were not, for some reason, even mentioned there. We find it very difficult to believe that, in a case with a death sentence a matter of such significance, which was noticed by the trial court, was not raised at all by counsel for the appellants. In any event, it ought to have been dealt with by the High Court after taking appropriate additional expert medical evidence under section 540 read with section 428, Criminal Procedure Code if that was considered necessary before deciding it.[2]

3.13.20 Powers of Court[65]

As an illustration, it was pointed out that out of 825 questions put to one of the medical witnesses. Dr. IB Majumdar, no less than 574 had been asked by the learned judge himself. The complaint was not limited to the number of the questions asked, but concerned also the stage at which they were interposed and the form in which they were put. It was contended that, quite frequently, the learned judge took a witness out of the hands of not only counsel for the defence but also counsel for the prosecution and pressed them with a series of questions to give the answer he wanted, and as regards the cross-examination, he destroyed its effect by intervening whenever any answer favourable to the defence was given and putting a series of suggestive questions to the witness till he retrieved himself and gave an answer favourable to the prosecution.

It was further contended that in so interrogating witnesses on his own account, the learned judge often introduced new matters and at times brought on record evidence which was wholly inadmissible, and he completed the error of procedure by denying to the defence an opportunity for further cross-examination. The objection taken was a serious one. If unfounded, it was improper objection to take; but if well-founded, the effect of the irregularity must be seriously considered.

The right of a judge to put questions to witnesses is given to him by section 165, Evidence Act. The section says that he may "in order to discover or to obtain proper proof of relevant facts, ask any question he pleases, in any form, at any time, of any witness, or of the parties about any fact relevant or irrelevant." The rest of the section and the provisos thereto are not material here.

It is obvious that the judge contemplated by the section is not a mere umpire at a wit-combat between the lawyers for the parties whose only duty is to enforce the rules of the

64. *Raghunandan v State of Uttar Pradesh,* AIR 1974 SC 463 : (1974) 4 SCC 186 : 1974 Cr LJ 453 (SC).
65. *Sunil Chandra Roy v state of West Bengal*, AIR 1954 Cal 305.

game and declare at the end of the combat who has won and who has lost. He is expected and indeed it is his duty to explore all avenues open to him in order to discover the truth and, to that end, question witness on points which the lawyers for the parties have either overlooked or left obscure or wilfully avoided. It has been said that it is particularly necessary that the judge should exercise this power in a jury trial, because it is his duty to aid the jury in obtaining a proper comprehension of the facts which they, as laymen, can do only if the facts are laid bare, with the implications not left as such but fully brought out and with the false suggestions eliminated. If, therefore, the judge finds that the examination of a witness is not being conducted in such a way as to unfold the truth, it is not only his right but his duty to intervene with his own questions, particularly at a jury trial.

But while theoretically the powers of the judges are limitless and unfettered, certain principles have come to be recognised which he must follow as to the manner in which he exercises the power. It need hardly be pointed out that he must not take a side; he must not also forsake the judicial calm for the zeal of a combatant.

Again, although the law allows the judge to put any question at any time, the time generally considered proper for an extended examination is when the lawyers for the parties have finished their questions or at least when the lawyer, examining the witness at the time, is passing on to a new subject. The judge may always intervene, in the course of examination by counsel, to put a question in a clearer form or to have an obscure answer clarified or to prevent a witness being unfairly misled, but if he does more and stops counsel again and again to put a long series of his own questions, he makes an effective examination or cross-examination impossible and diverts the trial from its natural course.

Having read the entire transcript of the evidence several times over in the light of the above principles, I am of opinion that no just exception can be taken as a whole, nor except in a very few instances, to their nature, but unfortunately, the time chosen by him for his interventions and the numbers of questions asked at a time, did at times have the effect of interfering unduly with both the examination-in-chief and the cross-examination and of putting the witness at an advantage or disadvantage.

As to the number of the questions asked, the learned standing counsel supplied us with a chart, the correctness of which was not disputed. According to it, the learned judge's questions, in the case of Nirmal, 139 against a total of 845, in the case of Mrs. Sati Mitra 35 against 284, in the case of Mr. Mahanti 21 against 171, in the case of Dr. Mahanti 28 against 147 in the case of Panchu Gopal Das 18 against 210, in the case of Jiban Krishna Das 10 against 165, in the case of Dr. Bose 8 against 81, in the case of Purnananda Sethi 17 against 195, in the case of Dr. IB Majumdar 574 against 825, in the case of Dr. Kabir Hossain 180 against 423 and in the case of Puspa Pal 132 against 817.

These were all the material witnesses and except in the case of Dr. Majumdar and Dr. Hossain, it can by no means be said that the number of questions put by the learned judge were usually or inordinately large. The reasons why the learned judge found it necessary to question the two medical witnesses extensively have been given by him in an order recorded on 13 June 1952 where he has himself stated correctly the permissible limits of judicial interrogation. The reasons are fully borne out by the record. It appears that in the case of Dr. Majumdar, the learned judge intervened before the cross-examination was over because the learned cross-examining counsel wanted break and in the case of Dr. Hossain, he did so before the cross-examination started, because the learned counsel asked for time till the next day. Rather than rising, the learned judge utilised the time in hand by putting to the witnesses questions of his own and it appears from the minutes that in the case of Dr. Hossain, he did so after ascertaining that the learned counsel had no objection. In these circumstances, it cannot at all be fair to charge the

learned judge with having interrupted the cross-examination, so far as those two witnesses are concerned. Nor can an exception be taken to the number of questions asked.

There is no limit to the questions which the judge may put and if he considers, as the learned judge did in this case that he has not yet got to the bottom of the matter or that the witness has not yet made his full meaning clear, there is no reason why he should not go on with the examination, whatever the number of the questions required to achieve the purpose of eliciting the truth.

Dr. Majumdar, in particular, was an exceptional witness in many ways. His delay in sending the viscera for chemical and pathological examination, the fact that he removed the pathological report and at least one other paper from the records of his office on the eve of his retirement and kept them with himself at his house for two months till his own examination before the committing magistrate, his claim that he had removed the papers on granting a receipt to his successor which the successor denied and the way in which, after deposing during his examination-in-chief to an effect which did not militate against the prosecution case, he conceded various suggestions in the opposite sense made to him during the cross-examination on the basis of theories, clearly provoked a close and comprehensive examination of his answers.

In my opinion, no fault can be found with the learned judge that he undertook such an examination. It appears further that the bulk of the questions put by the learned judge to these two witnesses were after their cross-examination had been concluded. It is true that both were recalled and then also the learned judge put some further questions, but whether or not the defence was given proper opportunities for further cross-examination is a separate matter which I shall deal with under another head. So far as the number of the questions put to these two witnesses is concerned and the points of time at which they were put, I do not think there is any just ground for complaint.

There is another reason which I think, no mistrial can be made out from the manner in which the learned judge interrogated the medical witnesses. The conception of the function of medical evidence on which the two doctor witnesses were cross-examined, appears to me to have been entirely mistaken and even if some over-interrogation by the learned judge took place on irrelevant matters introduced by the defence itself, such over-interrogation cannot be said to have affected the merits of the trial.[1]

3.13.21 Strictures[66]

1. It is abundantly clear that a trial court is expected to give only such remarks which are necessary to sustain a judicial finding. In other words, only such remarks need be made in the judgment which are in furtherance of the ends of justice and not to fulfil any other object except deciding the case in a correct perspective so that appropriate finding is given. It is undisputed that the remarks should be borne out from evidence and must not be pure surmises and conjectures made by the court. If the intention is to harm any public servant, or even if that intention is missing but the remarks made are reckless and are likely to jeopardise the interest of public service and endanger the prospect of a public servant and even injure his reputation or harm his official career, such remarks require to be expunged as they are no longer necessary. In other words, the remarks made by the trial judge should be *bona fide* and should be directed only to one and the only end, namely, the dispensation of justice in trial.

66. *ML Ahuja v State of Himachal Pradesh,* 1975 Cr LJ 330 : ILR 1975 HP 852.
Also see: *Raghubir Saran v State of Bihar*, AIR 1964 SC 1 : (1964) 1 Cr LJ 1 : 1963 BLJR 951; *SN Vyas v State of Rajasthan,* AIR 1966 Raj 164 : 1966 Cr LJ 798 : (1966) 16 ILR 81 (Raj); *State of Uttar Pradesh v Mohoammad Narain,* AIR 1964 SC 703 : (1964) 2 SCR 363 : (1964) 1 Cr LJ 549; *Jage Ram v Hans Raj Midha*, AIR 1972 SC 1140 : (1972) 1 SCC 181 : 1972 Cr LJ 768; *State v Amar Singh*, 1972 Cr LJ 1578 : (1972) 2 Sim LJ (HP) 287.

Nevertheless, the learned Sessions Judge has made certain sweeping remarks which, in our opinion, were not called for and must be expunged.

3.13.22 Fair Criticism of Courts[67]

Again in *Ambard v Attorney-General for Trinidad and Tobago*, 1936 AC 392 the law enunciated in (1900) 2 QB : 36 by Lord Russell of Killowen was applied and it was said at p 335:

> *But whether the authority and position of an individual judge, or the due administration of justice, is concerned no wrong is committed by any member of the public who exercise the ordinary right of criticising, in good faith, in private or public, the public act done in the seat of justice. The path of criticism is a public way; the wrong-headed are permitted to err therein; provided that members of the public abstain from imputing improper motives to those taking part in the administration of justice, and are genuinely exercising a right of criticism, and not acting in malice or attempting to impair the administration of justice, they are immune. Justice is not a cloistered virtue; she must be allowed to suffer the scrutiny and respectful, even though outspoken, comments of ordinary men.*

Lord Denning, MR, in *Reg v Commr of Police of the Metropolis, Ex-parte Balakbum (No. 2)* (1908) 2 WLR 1204 made some pertinent observations about the right of every man, in Parliament or out of it, in the Press or over the broadcast, to make fair and even outspoken comment, on matters of public interest. In the words of the Master of Rolls:

> *Those who comment can deal faithfully with all that is done in a court of justice. They can say that we are mistaken, and our decisions erroneous, whether they are subject to appeal or not. All we would ask is that those who criticise us will remember that, from the nature of our office, we cannot reply their criticism. We cannot enter into public controversy. Still less into political controversy. We must rely on our conduct itself to be its own vindication.*

The decision *Re The Editor, Printer and Publisher of "The Times of India,"* is very opposite and may be next referred to. In a leading article in *"The Times of India"* on the judgment of this court in *Aswini Kumar Ghose v Arabinda Bose*, AIR 1952 SC 369 : (1953) SCR 1 : 1952 SCJ 568, the burden was that if in a singularly oblique and infelicitous manner the Supreme Court had by a majority decision tolled the knell of the much maligned dual system prevailing in the Calcutta and Bombay High Courts by holding that the right to practise in any High Court conferred on advocates of the Supreme Court had made the rules in force in those High Courts requiring advocates appearing on the original side to be instructed by attorneys inapplicable to them. This is what was said by Mahajan, J, (as he then was) speaking for the court:

> *No objection could have been taken to the article had it merely preached to the courts of law the sermon of divine detachment. But when it proceeded to attribute improper motives to the judges, it not only transgressed the limits of fair and* bona fide *criticism but had a clear tendency to affect the dignity and prestige of this court. The article in question was thus a gross contempt of court. It is obvious that if an impression is created in the minds of the public that the judges in the highest court in the land act on extraneous considerations in deciding cases, the confidence of the whole community in the administration of justice is bound to be undermined and no greater mischief than that can possibly be imagined.*

The guiding principles to be followed by courts in contempt proceedings were enunciated in *Brahma Prakash Sharma v State of Uttar Pradesh*:[68]

> *It will be an injury to the public if it tends to create an apprehension in the minds of the people regarding the integrity, ability or fairness of the judge or to deter actual and prospective litigants from placing complete reliance upon the court's administration of justice, or if it is likely to cause embarrassment in the mind of the judge himself in the discharge of his judicial*

67. *Perspective Publications Pvt Ltd v State of Maharashtra,* AIR 1971 SC 221 : (1969) 2 SCR 779 : 1971 Cr LJ 268 (SC).
68. *Brahma Prakash Sharma v State of Uttar Pradesh,* AIR 1954 SC 10 : (1953) SCR 1169 : 1954 Cr LJ 238.

duties. It is well-established that it is not necessary to prove affirmatively that there has been an actual interference with the administration of justice by reason of such defamatory statement; it is enough if it is likely, or tend in any way, to interfere with the proper administration of law.

There can be no matter of doubt that in this country the principles which should govern cases of the present kind are now fully settled by the previous decisions of this court. We may restate the result of the discussion of the above cases on this head of contempt which is by no means exhaustive.

1. It will not be right to say that committals for contempt scandalizing the court have become obsolete.

2. The summary jurisdiction by way of contempt must be exercised with great care and caution and only when its exercise is necessary for the proper administration of law and justice.

3. It is open to anyone to express fair, reasonable and legitimate criticism of any act or conduct of judge in his judicial capacity or even to make a proper and fair comment on any decision given by him because "justice is not a cloistered virtue and she must be allowed to suffer the scrutiny and respectful, even though outspoken, comments of ordinary men."

4. A distinction must be made between a mere libel or defamation of a judge and what amounts to a contempt of the court.

The test in each case would be whether the impugned publication is a mere defamatory attack on the judge or whether it is calculated to interfere with the due course of justice or the proper administration of law by this court. It is only in the latter case that it will be punishable as contempt.

5. Alternatively, the test will be whether the wrong is done to the judge personally or it is done to the public. To borrow from the language of Mukherjee, J. (as he then was) in Brahma Prakash Sharma's case[1] *(supra) the publication of a disparaging statement will be an injury to the public if it tends to create an apprehension in the minds of the people regarding the integrity, ability or fairness of the judge or to deter actual and prospective litigants from placing complete reliance upon the court's administration of justice or if it is likely to cause embarrassment in the mind of the judge himself in the discharge of his judicial duties.*

———————

CHAPTER 4

SCENE OF OCCURRENCE

SYNOPSIS

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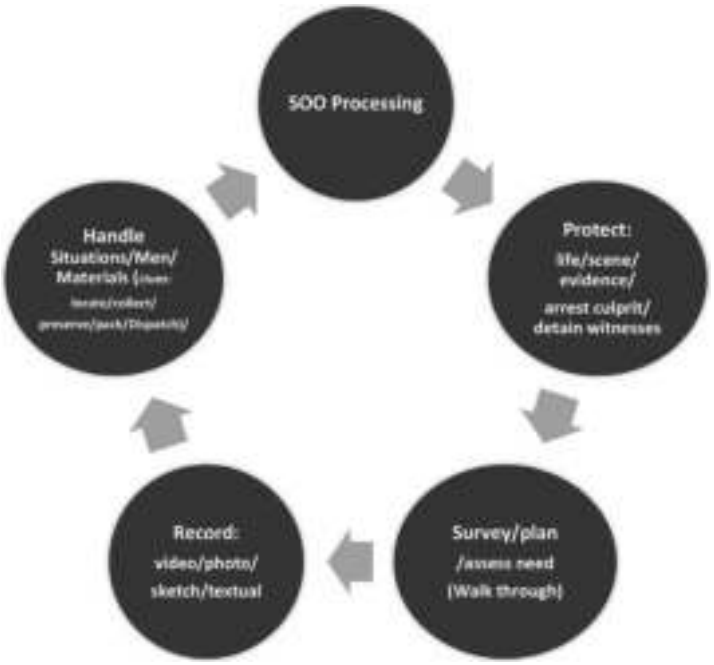

Fig. 4.1

4.1 IMPORTANCE (GENERAL)

The success or failure of criminal investigations starts and ends at the crime scene

A scene of occurrence is the place where an incident has occurred or a place where an incident-related material is found. The incident may be a crime, an accident or some other occurrence. We discuss mainly crime scene in the chapter.

The crime scene(s) may be a single site or multi-point sites. For example, in a case of kidnapping, the place from where the person has been kidnapped, the vehicle in which he had been moved, raped or killed, the places where he was hidden, the place where he has been murdered and the place where the *corpus delicti* is secreted are all essential elements of scene of crime. In short, a crime scene is a place where the crime took place and carries some exchanged or leftover evidence relating to the crime. It is the place that provides crime or standard evidentiary clues for comparison *inter se*.

A crime scene is any place that usually provides vital evidence to link the criminal with the crime. It may be a human body, a building, a vehicle, a water body, or an open space where incriminating objects are located.

The crime scene is the place where the persons involved in the crime (the culprit, the victim, their associate or witnesses) come across one another. They exchange traces *inter se* and with the scene, leave odds and ends, including marks of tools, wearing apparels, tires, hands, fingers, feet and other body parts. There is disturbance often at the scene, which helps to understand the sequence/pattern of events. Thus, the scene of occurrence provides a wealth of clue materials and other evidence that is useful to:

1. Establish *corpus delicti*.
2. Link the criminal, the victim and the scene of occurrence *inter se*.
3. Evaluate the pattern of events.
4. Indicate modus operandi/sequence of events.
5. Help reconstruction of the occurrence.
6. Find the fugitive criminal(s), the secreted victim and the hidden vital evidence.
7. Find the number and nature of the weapons.
8. Know the transport used.
9. Ascertain the routes of ingress and egress.

The crime scene is of great importance in almost all crimes. It may be less useful in cyber/computer crimes and in some document related problems.

The scene of occurrence changes with time. It cannot be preserved indefinitely. Besides, some of the evidence gets lost soon after the occurrence. Some other evidence contaminates or alters the original evidence with passage of time. The occurrence may be on a busy road. It cannot be closed for a long time. The crime scene examination, therefore, brooks no delay. It needs immediate processing.

The scene may be indoor or outdoor. It may be a room, a cellar or a roof. It may be a road or a roadside, an open field, a jungle, a hill or a mountain, a stream or a river pond. It may be a pond, a lake or seashore. It may be a vehicle: a car, a truck, a bus, a train, a boat, a ship or an aeroplane. Every scene of occurrence presents unique aspects for which the examination technique may need some modification.

The opportunity to examine the scene is available only once. If the same is not fully exploited the wealth of information about the crime is lost.

4.2 THE PROBLEMS/POSSIBILITIES

The examination of the scene of occurrence should help to answer the following questions:

1. Is the alleged scene of occurrence genuine or fake?
2. How did the criminal and the victim reach the scene?
3. What were the entrance and exit points?
4. How many criminals and victims were involved?
5. What was the *modus operandi?*
6. What evidence did the criminal and the victim exchange?
7. When was the crime committed?
8. Why did the victim/criminal behave in a particular way?
9. Who were the criminals or victims?
10. What did the criminal do after the commission of the crime?
11. Who did the criminal visit after the occurrence?
12. Could the behaviour of the criminal at the scene help to build his profile?
13. Could the language/dialect/accent indicate the region/area to which he belongs?

4.3 LOCATION

The scene of occurrence is identified/located from the following:

1. Presence of *Corpus delicti.*
2. Marks of struggle.
3. Accounts of eyewitnesses.
4. Abandoned articles and other clues including impressions/prints/body fluids/bloodstains. For example, a stain of ejaculated semen, once, established the site of rape.
5. Traces carried over from the scene. For example, once, the plant fragments on the clothes of a child indicated the place of assault.

It is not difficult to identify/locate the scene of occurrence, but sometimes criminals fake a scene to mislead the investigators, to avoid suspicion and try to pass on the guilt to others. Sometimes, natural phenomena may change the scene of occurrence. Water currents or fish may carry away the body. Carnivorous beasts may drag the corpse to jungles and to other open spaces. It is essential, therefore, to establish that the scene is genuine. It is the first step.

4.4 EVALUATION

Proper evaluation of the scene of occurrence is a time-consuming job. It involves the following:

1. Protection of the scene
2. Photography/video filming the scene
3. Sketching the scene
4. Searching the crime scene
5. Location/collection/preservation/packing the clues
6. Documentation of the crime scene
7. New tools and techniques in handling the crime scenes

4.4.1 Protection

The investigating officer cannot always reach the scene immediately after the occurrence. The first police officer who reaches the scene, therefore, should preserve the evidence. He should:

1. Check the injured for any signs of life. If there is even a remote chance of life, he provides medical help immediately. The injured is transported to the nearest hospital. The injured is handled with deliberation and caution to disturb the scene to the minimum extent possible. If the injured are already dead, the dead bodies should be moved after processing the scene.
2. Expel all unauthorised men like relatives and friends of the victim or of the culprit, onlookers, photographers and media persons from the scene. No one should be allowed to enter the scene. They should be handled carefully, politely, persuasively, yet firmly.
3. Barricade the scene of occurrence so that it remains unaltered. Enclose a larger area rather than a smaller one so that no possible clues are left outside the barricaded area.

4. Segregate the suspects and the witnesses, so that they do not discuss the case with one another.
5. Arrest the identified culprit. Detain suspects. If one tries to run away, arrest him.
6. Prevent even fellow police officers (including the senior officers) from entering the scene to satisfy their curiosity. Only the officer-in-charge of the case should determine when, why, and who is to enter the scene.
7. Desist starting independent searches and inquiries.
8. Assess the need for assistance of other police officers or specialists (photographers, draughtsman, experts from forensic science laboratories and medico-legal experts). They are called in at the earliest.
9. Seek help from home guards or other similar organisations to protect the scene, if necessary.
10. The superior officers are informed about the nature of crime and the help required, through telephone.
11. Remain on guard throughout until the IO takes over. The scene of occurrence is not left unguarded. Home guard personnel are available at most of the place, they should be sent for outside duties, if required.
12. Record the name of the informant with his address, the time when he gave the information and the alleged time of occurrence. Detain him to get additional details.
13. Refrain from discussing the case with anybody including suspects, complainants, victims, witnesses, onlookers or the pressmen.
14. Keep his ears and eyes open to listen to any passing remark or to observe the behaviour of the persons around.
15. Avoid introduction of any material like cigarette stubs, cigarette ash, foot or footwear marks or fingerprints at the scene.
16. Preserve the doors, windows, staircases, lighting, and routes of ingress or egress in their original condition until the investigator arrives.
17. Record the time of arrival, note and record the weather conditions and that of the crime scene.
18. Record the smell/odours/scent/stench at the scene or with the victim especially that of alcohol, tobacco, perfumes or explosives.
19. Refrain using the utilities like bathroom, washbasin, lavatory, towels, telephone which are part of the scene of occurrence.
20. Leave the various articles at the scene at their original from its place.
21. Refrain from cleaning/re-arranging the articles at the scene, even if the scene is in a mess.

Alteration of positions of objects may have to done in emergencies. Record the original/changes photographically. The first officer follows the Mantra in the textbox.

Fundamental Mantra for first police officer:
preserve the SOO: **"As is, as it was"**

4.4.2 Photography

Fig. 4.2
Modern Digital Camera (A 12 + Mega Pixel DSLR)
Results comparable with the best Film SLR

The scene of occurrence is photographed as a matter of routine. Digital photography has brought about a revolution in photographing a scene. It does not add materially to the cost of investigation and trial. Yet they help the courts and the counsels to understand the occurrence.

The photographs of the scene of occurrence are very useful:

1. It is rather rare for the judges, the jury and the lawyers to visit the scene of occurrence. Proper photographs of the scene bring the scene to the courtroom. They are better than verbal or written descriptions. A video film brings the scene of occurrence to the courtroom more vividly. It is highly informative.
2. The pressure of work may force an investigating officer to overlook certain details. Proper photographs (and a video film) of the scene make these details available to him even long after the occurrence.
3. The investigating officer is influenced sometimes, by the account of an interested person and examines the scene with a preconceived theory, even unconsciously. Later, certain facts lead to different conclusions. If a video film is available, it helps to verify the new version.
4. Sometimes, the eyes may not observe certain facts (for example, washed bloodstains and marks of disturbance at the scene). The cameraman will photograph them and keep a permanent record.

5. Skid marks, tire marks, foot and footwear marks are found on highways and busy roads. The marks are difficult to pick up. The road needs opening, to avoid serious dislocation of traffic, at the earliest. Photography is fairly effective and quick mode. It records the evidence immediately.
6. The photographs prove useful in determining the extent of responsibility in vehicular accident. They provide the needed proof.

   A minor traffic accident involved a bus and a truck. The bus operator sued the truck owner for damages in a civil suit. From the photographs of the scene of occurrence and of the damage to the truck and to the motor bus, taken at the time of occurrence, the extent of guilt of the parties involved could be established. (CH)
7. A video camera is very effective to cover all types of crime scene properly. It is indispensable in riot cases. It records the identities of the participants and the part played individually by them, such as shouting slogans, inciting people or damaging public or private property.

   During the murder of a President of the United States of America, while he was addressing a public meeting, a documentary video film was being made for the event. It also recorded the movement and action of the murderer. The film provided irrefutable evidence against the culprit. (CH)
8. The perishable evidence like wounds on a dead body, traces of resistance, scratches, tears, rents, swollen flesh in rape cases, and strangulation marks are best recorded and preserved through photographs.

   In a murder case, the injuries found on the dead body were small pellet holes surrounding a rat-hole. The prosecution alleged that the injuries were caused by a single gunshot from about 8 M. The defence challenged the version. They quoted books mentioned that separation of pellets starts from about 3 M. They also produced an "expert" who said that the description of injuries indicates that two shots were probably fired.

   If the theory of two shots were accepted, the accused would have been given the benefit of doubt as the witnesses had observed only one shot being fired by the accused.

   There were no photographs of the injuries. It was, therefore, difficult to visualize the exact nature of the injuries. However, the doctor who had carried out the post-mortem examination was available. He, on request, sketched the injuries from his memory and the available written description.

   The author test fires with the same gun and similar ammunition from the alleged distance. They created pellet patterns with a rat in the centre like the one sketched by the medico-legal expert. The pattern obtained on a filter paper sheet was submitted to the court. The demonstration convinced the court that the thesis of the prosecution that only one shot was fired was correct. (CH)

4.4.2.1 Camera

Digital imaging has ushered in a new era in photography—a real revolution. The camera functions like an ordinary camera but does not include a film. Instead, there is a memory card that records the pictures, stores them and permits recall of the snap for checking its quality soon after taking the snap. The images, thus, recorded can be transferred to a computer and processed there. Their prints are obtained through a computer printer.

The main advantages are:

1. High-resolution cameras give pictures of high quality compared to photographs taken with the conventional camera-film combo.
2. The cost of the pictures is substantially low.
3. Digital cameras were costly to start with. Now it is comparable with film cameras of corresponding quality.

4. Image processing, through computers, has made it cost/time effective.
5. Computer software for editing the images is extremely handy.
6. The digital camera has dispensed the need for frequent loading/unloading films. The memory card can record hundreds of images simultaneously. The memory cards have variable capacity to suit the need.
7. Digital photography does not need a photo studio for processing images to pictures. Computer is used to process the images.
8. Photography is possible even in inadequate light *vis-à-vis* film photography.
9. Wide-angle lens and telephoto lens are used in special situations in the same way as in film photography. The former covers closed areas like bathrooms and kitchens and the latter distant objects, like a dead body in a deep well adequately.
10. The main advantage of digital photography in a crime scene photography is that the quality of the images can be checked and imperfect snaps can be eliminated then and there with impunity.

Formerly a studio camera was used for the photography of scene of occurrence. It was bulky and, therefore, inconvenient to handle. A light and handy 35 mm quality reflex camera substituted the old one. With some accessories (wide-angle lens, telephoto lens, close-up attachment, flashgun, photoflood lamps, exposure meter and a collapsible stand), it could handle most of scenes adequately. A photographer kept a supply of high-quality films (black and white and colour) with varying speeds and contrasts to meet various situations. Now, a high-quality digital camera[1] is used. It meets the crime scene photographic demand adequately.

The only disadvantage of a camera is its small format, but it is easily compensated by the high-quality digital images. The ease of process and extensive manipulation has made film photography redundant and it is on its way to extinction.

4.4.2.2 Coverage

The investigating officer himself can photograph the scene. However, a professional police photographer is employed. In all cases, the investigating officer decides the coverage.

TIPS FOR CS PHOTOGRAPHER

1. Discuss and evaluate the needed coverage with the investigating officer
2. Use tripod for close-up photography.
3. Take photographs from outside of the CS or from the core (central focal point) of the scene, if OK.
4. Use digital camera. Record images liberally. They are less expensive.
5. Follow the photographic drill strictly:
   a. Connect the scene with the surroundings.
   b. Connect the evidence with the source/site.

1. *See* chapter 27 on Digital Images.

c. Photograph each piece of evidence twice from:
   - Distant range
   - Mid range
   - Close range: close-up view.

d. Check quality of each image there and then. Usually there is no second chance, once you leave the scene. Discard the defective, retake the image.

6. Keep spare camera, flash, batteries, for back up.
7. Maintain a photographic log for reference.
8. Ensure identity, integrity, authenticity and relevancy of the images by imaging identification data in the images, whenever possible.

The following principles promote better coverage:

1. At least four photographs are taken for the general view, four for the *corpus delicti* and at least two for each of the items of evidence discovered at the scene.
2. Close-up photographs are taken along with a scale to indicate dimensions of the items photographed.
3. A record of the items covered, positions of the camera, and type of illumination used, if any, is kept.

The items photographed are:

1. The main site of the scene of occurrence; it should include such item that can identify the location of the scene of occurrence.
2. The route of approach of the criminal.
3. The point of the entrance/exit.
4. The location of the *corpus delicti.*
5. The position and identity of the *corpus delicti.*
6. The evidence on the deceased (injuries, weapon, hair and fibres in his hands or on his person).
7. The marks of struggle including bloodstains, disturbed furniture, bedding and the like.
8. The evidence left by the criminal, like the weapon of offence, bullets, cartridge cases, cigarette stubs, items of wearing apparel, fingerprints, foot or footwear marks, bullet holes and marks and tool marks.
9. The place(s) from where the culprit could possibly pick up clue materials e.*g.,* paint, broken glass, fibres, mud.
10. The route of departure.

Fig. 4.3
Establishing the location of the scene

Fig. 4.4
Close up for identification

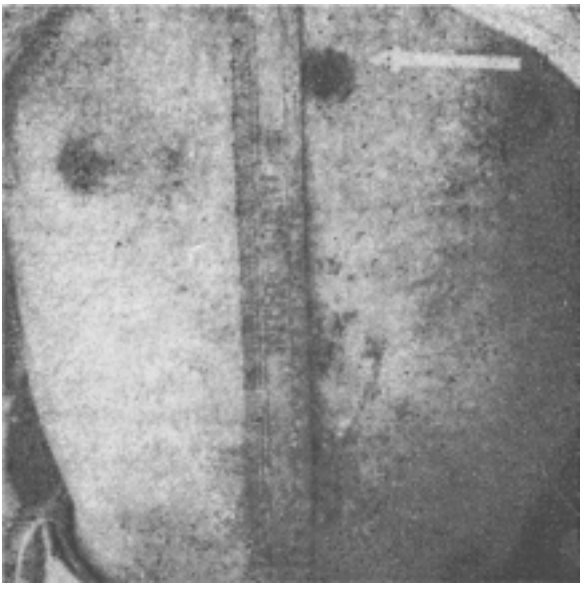

Fig. 4.5
Close up for the wound of entrance

Fig. 4.6
Exit wound close up – continuation of wound in Fig. 4.5

If some persons witnessed the occurrence, images from their viewing site are also taken. The images are useful to check and demonstrate the veracity of the witnesses.

4.4.2.3 Photographic Exhibits

The following points are kept in mind when the exhibits of images are prepared for presentation on the court:

1. The number of photographs/images from the scene of occurrence which are produced as exhibits in the court, should not be large. A large number may distract/confuse the court. The images are properly arranged and produced at appropriate times.
2. The photographs should be free from distortions, glares and shadows. They should have the proper perspective and tonal relation.
3. It is convenient to produce 10 × 15 cm to 20 × 30 cm photographs. They are easy to view and handle.

Fig. 4.7

General view of the scene

Fig. 4.8

Position of the dead body

4.4.3 Recent Advances in Imaging/ Photography of the Scene

Tremendous innovations have taken place in handling the scene of occurrence, including the following:

4.4.3.1 Aerial photography

Aerial photography has been used to photograph the expansive outdoor scene of occurrence. It allows better appreciation of the position of the objects involved in the crime. It is indispensable where large areas are involved. Air, ship and train disasters are best covered by aerial photography. Police departments are acquiring drones to handle crime scenes.

4.4.3.2 Colour photography

Colour photography is used routinely. It is useful in photographing injuries and discoloration of body skin especially in rape and other offences against person. It is also useful to demonstrate the colour difference in some other forms of evidence. Colour photography is being used routinely by all police forces as the colour photography has become cheap. Digital cameras record objects in their natural colours.

4.4.3.3 Video filming

Video cameras are fairly inexpensive in modern times. A properly educated investigation officer would use video filming in all important cases. In some scenes, it is indispensable. For example:

- Rioting,
- Detection of insurance frauds (feigning grievous hurt),
- Detection of sale/purchase of narcotics,
- Betting and gambling offences, and
- Driving under the influence of alcohol.

The use of video filming, to cover the scenes of crime, in our country is limited. However, it has great potential to record the crime scenes. The obvious advantages are:

- The cost of the video film is low.
- The pictures obtained are of high quality.
- Large areas can be covered.
- The results can be verified immediately.
- It is an excellent substitute for cinematography to record actions and movements (rioters!).

The main disadvantages are, though individual snaps can be obtained, yet it is not common. Usually the film itself is projected and shown. The courts may not find the same convenient. Video filming, however, has a great future. It will play its rightful role in covering the crime scenes.

4.4.3.4 The use of markers

Markers like flags or circles made with a chalk piece to indicate the position of small items provide better coverage of the evidentiary clues. Ordinarily, two photographs, one before and one after putting the mark are taken for each item.

4.4.3.5 Photogrammetry

It was being used increasingly in some countries to photograph the scene of occurrence. The main advantage of the technique was that it dispenses with the measurement of inter-distances and preparation of sketches. The photograph provides the necessary data on further processing. Its cumbersome nature has not made it popular. It is not used in India.

4.4.4 Sketching

Sketches are handy in depicting important evidence at the scene of occurrence. In combination with the photographs, the sketches provide an ideal presentation of the scene.

1. They indicate the basic set up of the crime scene.
2. They indicate inter-distances and position of the relevant evidentiary clues only.

The police requires the services of revenue officials (or a draughtsman) in all important cases to draw sketches or of a draftsman to sketch the scenes of occurrence. They have the necessary training and experience in preparing plans and drawings of the type required in police work. They are available even in rural areas.

The revenue official should draw the general outline of the scene in black ink and the investigating officer should fill in (or get filled in) details of the evidence observed in red ink. A carefully and conscientiously prepared sketch in this way is a useful piece of evidence.

The following aspects are kept in view while sketching the scene:

1. The sketch of the scene is prepared at the site and not in the office/residence of the investigating officer.
2. The distance is measured with a tape and not by paces, or guessed.
3. A suitable scale is fixed and indicated on the sketch. The following scales are suitable:
   - For indoor scene: **1: 5 to 100.**
   - For building/outdoor **1: 50 to 500.**
   - For large areas: **1: 1000 to 10,000.**

4. The direction is determined using a compass. An arrowhead is put to indicate **NORTH.**
5. Non-involved entities are not indicated (introduced) in the sketch.
6. Symbols, letters or digits, and a legend are used to avoid crowding.
7. Sketching need some simple equipment: a measuring tape, a drawing board, a ruler, a set of triangles, graph, drawing paper, pencils and an eraser, ordinarily, meet the requirements.

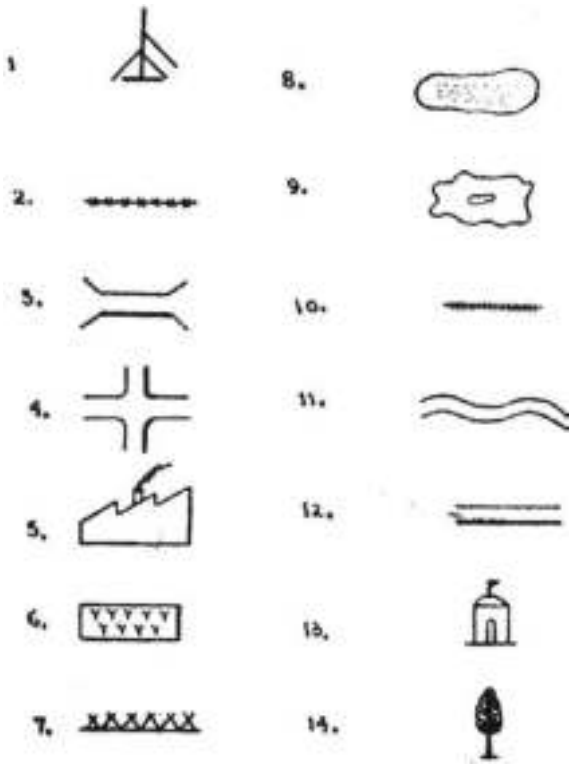

Fig. 4.9

Conventional Symbols

"1. Wireless Aerial, 2. Boundary, 3. Bridge, 4. Crossing, 5. Factory, 6. Fields, 7. Hedge, 8. Pasture, 9. Pond, 10. Rail Line, 11. River, 12. Road, 13. Temple, 14. Tree."

There are various methods of drawing sketches. The following are common:

4.4.5 Coordinate method

The coordinate technique is mostly used. A focal point is chosen and two lines crossing each other at a right angle are drawn. One line (x) represents the length and the other (y) the width of the scene to be covered. The locations of the clue objects are then filled in the outline diagram after determining the coordinates (position/distances from the focal point).

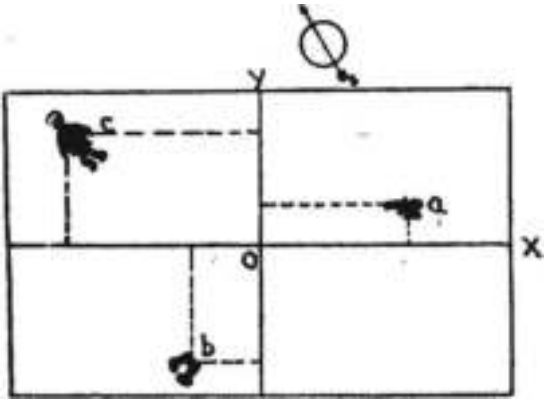

Fig. 4.10

Coordinate method

Scale 1: 50

Legend: (a) Weapon, (b) Shoes, (c) A body

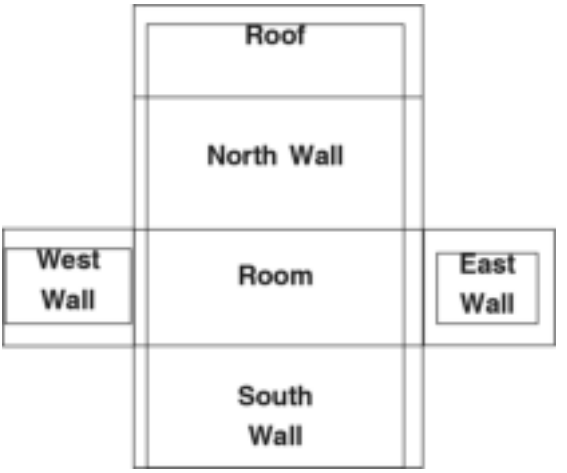

Fig. 4.11

Extended coordinate Method

4.4.6 Polar technique

It is used for expansive outdoor scenes. Here instead of drawing co-ordinates, the distances and directions of the evidentiary objects are noted with reference to a central (focal) point. The positions are recorded on the sketch accordingly.

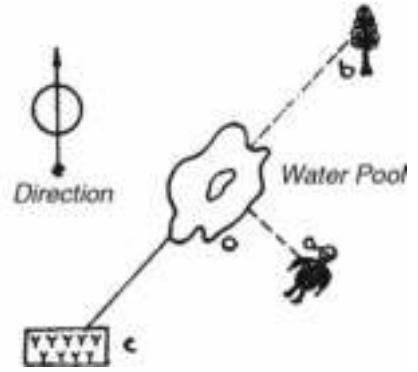

Fig. 4.12

Polar method

(Scale 1:1000) Legend: (a) Body. (b) Axe in bushes. (c) Disturbed grass.

4.4.7 Electronic Graphics

Advances in electronics have further simplified the sketching process. Computers and special software are being utilised increasingly to get the final sketch. Many software has come up in the market, which has improved the quality and the accuracy of the sketches/maps tremendously. They have also reduced the time for their preparation and drudgery. The software has also come up which can introduce image of the object in the outline of the sketch.

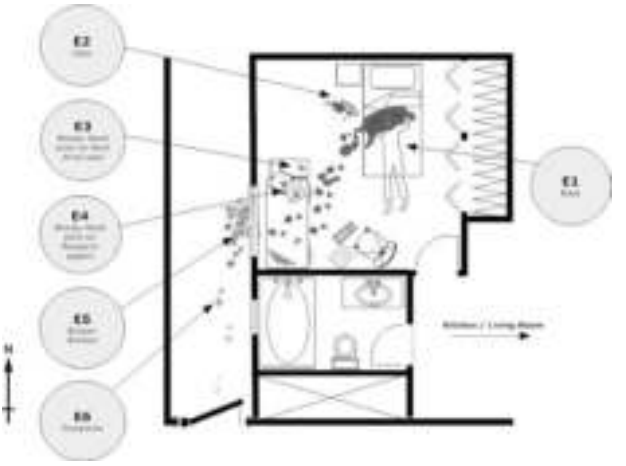

Fig. 4.13

"Smartdraw" [2] electronic software graphics. A typical 3-D sketch

4.4.8 Height Determination

It is sometimes essential to determine the height of buildings, trees, roofs, bullet holes and the like.

2. Proprietary name of the software.

There are a number of techniques for the purpose. A simple technique, without involving much of equipment, measures height with the help of two straight sticks. One (S) about 1 M long and the second (L) about 2 Ms long. The first one is correctly measured (say 1 m) and its corresponding position (L′) is marked on the longer stick. The shorter stick is fixed at a convenient distance from the object (building, tree, mountain peak) and the longer stick is fixed about 3 M ahead towards the object. The object is seen from the top of the shorter stick. The point (L″) where the line appears to cut the longer stick is noted. The height is then calculated from similar triangles SL ‘L″ and SO′ O″.

O′O″/L′L″ = SO′/SL′ = D/d

Or, O′O″ = L′L″ × D/d

Because D and d are known and L′ L″ is determined, O′ O″ can be calculated. The height of the object is O′ O″ + length of the stick (s).

In important cases, the help of surveyors for detailed drawings and sketches of expansive scenes of occurrence should be obtained. They can also determine the height of the object correctly with the help of sextant, an instrument for measuring heights (or depths).

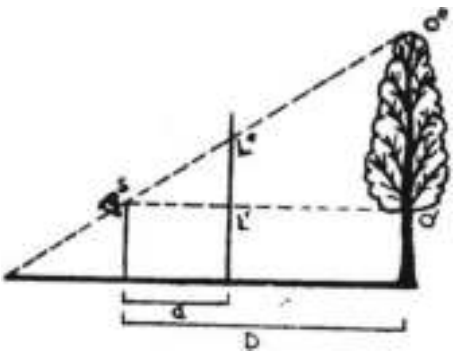

Fig. 4.14

Height determination

4.4.9 Search

Search for the clue materials requires a careful and thorough examination of the scene of occurrence. The search techniques vary from one scene to another. They also vary on the personal choice of the investigator. The following methods are common:

4.4.10 Zonal Method

In the zonal method, the scene is divided into small zones and each zone is examined in turn. In expansive scene more than one team can search their specified (allotted) zones.

1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16

Fig. 4.15
Zonal Method

4.4.11 Spiral Method

The search starts from the focal point of the scene and carried out in spiral with increasing circumference until the whole of the crime scene is covered.

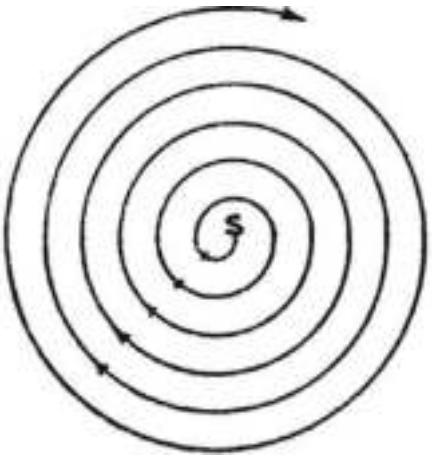

Fig. 4.16
Spiral Method

4.4.12 Strip Method

The scene of the crime is divided into strips of convenient width and each strip is examined, in turn, carefully.

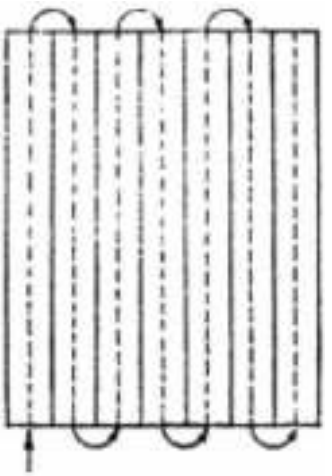

Fig. 4.17
Strip Method

4.4.13 Cross-hatch Search Method

In cross-hatch method the search is carried out two dimensionally. First the scene is covered lengthwise (as in strip method) and then width wise as shown in the diagram. It provides a double examination of the same spot.

Other methods have also been suggested in the literature. The method adopted is not so important. However, thoroughness, keen observation, care and planning are important.

It is often helpful to employ a second person or a second team to search the same scene over again.

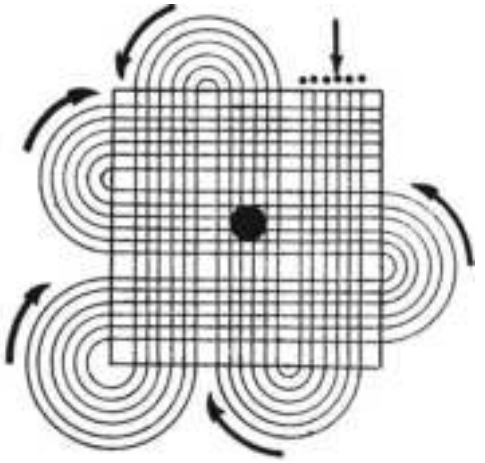

Fig. 4.18
Cross-hatch Method

4.4.14 Equipment

A torch, a hand magnifier, a compass, a measuring tape, a steel scale, a notebook and a pencil are the basic minimum requirements for the search. In addition, a number of receptacles, casting and lifting materials, and packing paraphernalia is required.

4.4.15 Handling Clues

Handling of specific clues has been discussed in various chapters. It is proposed to consider here the fundamentals only.

1. Distribution and the nature of the materials at the scene are carefully noted. All foreign (not belonging to the place) materials: weapon of offence, bullets, cartridge cases, poison containers, vomitus, wearing apparel, prints and impressions, stains and odours are clues. They should be collected and recorded irrespective of the fact whether they appear or do not appear to be relevant to the case at the time of collection.
2. The collection should be so organised that nothing is missed, nothing gets lost, misplaced or contaminated.
   - Microscopic evidence like hair, fibre, dust and paint should be collected first;
   - Prints and impressions are processed next; and
   - Larger objects are gathered last. Collection of one object should not alter, destroy or contaminate the other evidence.
3. A careless investigating officer may introduce his fingerprints on the objects handled by him. Some writers suggest the use of gloves to guard against evil. However, the practice is undesirable if it is likely to destroy microscopic and print evidence due to complacency.
4. Bacterial growth and other physical or chemical changes destroy or contaminate bio evidence especially when wet stains or liquids are sent to an examiner without taking proper precautions to prevent these changes. As a rule, wet articles (excluding liquids) should be packed only after they are perfectly dry.
5. Contamination or destruction may occur due to dirty or fragile receptacles, packing corrosive materials in containers susceptible to corrosion, and introduction of cigarette ash and dirt, due to carelessness on the part of the investigating officer.
6. There should be no seepage of materials. The original character of the contents will otherwise be lost. Plastic bags, bottles and glass containers with proper lids or stoppers prevent spilling or contamination.
7. The exhibits should be packed in such manner that they are not damaged on opening. Only one item should be packed in one packet. If necessary, a number of packets (properly marked) may be dispatched in one box or in one large-sized packet. A copy of the description of the contents of various packets in the box should be placed inside.
8. Exhibits of different cases should be packed separately.
9. The articles should not get rubbed, scratched or scraped in the transit; valuable-evidence, otherwise, gets contaminated or lost.
10. Dangerous articles and the exhibits likely to get damaged in transit should be sent through a special messenger.

11. The chain of custody of evidence should be unbroken and fully established:
    - The article recovered should be marked and initialed, with date if possible. In doing so, however, the evidence on the exhibits should not be disturbed. For example, bullets are not marked at the places where they carry marks from the barrel of the firearm. Likewise, the documents involving erasures and alterations are not marked at these sites.
    - The evidence is collected, packed and sealed in the presence of two reliable and independent witnesses and their signatures should be obtained on the sealed cover. A specimen of the seal is placed on the case file. Another specimen seal impression is sent to the expert along with the covering letter. The seal should be clear and legible.
    - The number of the case with date, the name of the police station, description of the contents, the name of the investigating officer, and the name of the witnesses along with their signatures is written on the label. The label is so secured that it does not come off easily.

In a case, exhibits were sent duly sealed to the expert, along with a specimen seal of the magistrate with whose seals these were sealed. The expert identified the seals in the court, but when the magistrate (a witness in the Sessions trial) examined the seals, he found them different from his own seal. (CH)

In another case, a bullet was sealed in a bottle. The cap (screw type) of the bottle could be unscrewed along with the patch of cloth bearing the seal impression and re-screwed without breaking the seal. (CH)

In still another case, a parcel bore six seals with the same monosyllable. When critically examined, they were found to originate from two sources. The defence alleged tampering of the evidence and got acquited. (CH)

Fig. 4.19

Defective sealing. The parcel can be opened without breaking the seals

In a murder case, the cartridge case was stored in a damp place. When they were put in the court (along with a score of other cartridge cases) fungi and incrustation had damaged the identification marks on them so much that the correct cartridge could not be identified. (CH)

In a murder case, the exhibits (a gun and a cartridge case) were correctly dispatched from the laboratory. They were exhibited on the first day. But when the expert appeared on the second day, the cartridge case could not be located anywhere. Presumably, it had been stolen from the courtroom. (CH)

In another case, the questioned document has been replaced. A fictitious document was put up in the court for the identification. (CH)

- A minimum number of persons should handle the evidence. The ideal sequence is from the investigating officer to the expert and from the expert to the court.

Investigator ⟶ **Expert** ⟶ **Court**

However, it is not always possible. A note, therefore, is kept to show where, when, and why the evidence was with a particular person.

- The exhibits are dispatched to the concerned experts promptly through a special messenger. Otherwise, the defence alleges tampering of the exhibits. Quite a number of cases are dismissed because the investigating officer did not dispatch the exhibits promptly to the expert and could not account for the delay.

4.4.16 Recording

The evidence chart (Appendix) is useful to record the collection of evidence at the scene. This chart is in addition to usual forms required by the rules.

4.5 MODERN AIDS

Keeping in view the importance of the scene of occurrence the police departments all over the world have organised systems to improve, facilitate and expedite the handling of the scene of occurrence. The facilities provided vary.

4.5.1 Investigator's Kit

Investigator's kit is a collection of items needed by the investigating officer at the scene of occurrence. It generally contains:

4.5.2 Examination kit

An examination kit contains a compass, a magnifying glass, a mirror, a torch (with spare bulbs and cells), a scale, measuring tapes, calipers, forceps, tongs and a pair of rubber gloves are the major components.

4.5.3 Making and breaking kit

Making and breaking kit contains a diamond pencil, scissors, scalpel, knife, adhesive tape, twine, wire and tool kit containing a set of screwdrivers, jimmy, adjustable wrench, wire cutter, saw, hammer and pliers.

4.5.4 Fingerprint kit

Fingerprint kit includes inking slab, ink roller, thumbprint ink tube, and powders: grey, graphite and anthracene, camel hair brushes, lifting tape, iodine fuming tube, glass wool, iodine and anhydrous calcium chloride.

4.5.5 Casting kit

Casting kit contains talcum powder, powder sprayer, lacquer and lacquer sprayer, rubber cup, ladle, plaster of Paris, sieve, aluminium strip frames, wire gauze, salt, scale and a towel.

4.5.6 Blood testing kit

Blood testing kit consists of high-quality filter paper circles about 10 cm in diameter, spatula, scalpel, droppers, pipettes, distilled water, saline solution, glacial acetic acid, benzidine, (benzidine tablets are preferable), barium peroxide and methanol.

4.5.7 Collection paraphernalia

Collection paraphernalia has numerous items. It includes a set of clamping boards with nuts and bolts, screws, nails, cardboard boxes of various sizes, (economy of space is achieved by placing one into another in the decreasing order of size), plastic and paper bags and envelopes, kraft paper and cellophane sheets, clean white linen, tissue paper, absorbent cotton, test tubes, bottles of various dimensions (20 ml, 50 ml, 100 ml, 500 ml and 1 L) with screw and glass stoppers.

Rubber bands, gummed labels, tags, needles and thread, sealing wax, seal and spirit lamp are needed for sealing and labelling.

4.5.8 Recording equipments

Recording equipments like writing board, graph paper, noting sheets, carbon paper, drawing paper, various types of forms (for example, fingerprint form, recovery memo forms) pen, pencil, coloured pencils, erasers, scale, mathematical drawing box and compass.

It is not convenient to carry all these items at all times. Nor are they necessary in every crime. It is, therefore, convenient if the items are kept ready and those required in a particular investigation are taken to the scene.

In addition, video/digital cameras are also record.

4.5.9 Mobile Laboratory

4.5.9.1 Need

An average investigating officer does not know the importance of all the traces left at the scene of the crime, nor does he know the proper sampling techniques. He may fail to preserve important items of evidence or specimens. The laboratory staff help him in this regard. They also eliminate some of the exhibits by examination at the spot. They sometimes give guidelines to the investigating officer to pursue a particular line of enquiry from the spot examination. It is, therefore, generally considered desirable that the laboratory experts should join the team to examine the scene of occurrence in all important cases.

In a multi-murder case, the author, along with the mobile unit of the laboratory pitched a tent at the scene of occurrence and assisted the investigating team:

1. *Photographed the scene, including fingerprints on the vehicle and foot and footwear marks at the site and on the route of departure of the culprits.*
2. *Provided photographic facilities to the medical team in the post-mortem examination.*
3. *Fixed/identified the culprits' departure route. Checked, photographed and collected the prints and impressions found enroute.*
4. *Indicated the possible number, height and built of the culprits from the study of the gait patterns.*
5. *Checked the footwear of some suspects and eliminated their presence at the site.*
6. *Predicted the possible types of firearms used from the size and nature of the wounds and from the projectiles recovered from the bodies.*
7. *Helped to extract projectiles undamaged, from the dead bodies at the time of postmortem.*
8. *Checked the projectiles at the time of post-mortem examination and gave the number, type and possible make of the four firearms which the culprits used in the commission of the crime.*
9. *Eliminated some firearms seized from some suspects. (CH)*

4.5.9.2 Paraphernalia

The mobile laboratory usually consists of:

4.5.9.3 An MUV or SUV vehicle, with four-wheel drive

The vehicle has customised fittings to house equipment for crime scene examination. It also carries a collapsible camp chair and a small examination table. Lighter vehicles are preferred, mainly for their speed and easy accessibility to the crime scenes in rural areas.

The vehicle is fitted with powerful storage battery, which is used for floodlights and operating the instruments where there is no electricity.

4.5.9.4 Investigator's kit

All the items mentioned in the investigator's kit above are kept in the vehicle.

4.5.9.5 Photographic equipment

A high-quality digital camera with various accessories including close-up attachments, wide-angle and telephoto lenses, photoflood lamps, flashguns, lightmeter and ultraviolet, infrared, polar screen and colour filters. A Video camera is also becoming part of the photographic kit of the Mobile Laboratory.

4.5.10 Portable Ultraviolet lamp/Infrared lamps/Small portable X-ray unit

4.5.10.1 Miscellaneous

Magnifiers, stereomicroscope, hand spectroscope, vacuum cleaner, avometer, and electricity tester.

Many state governments in India have organised **Scientific Crime Scene Units,** who visit important crime scenes. They have a scientific officer, photographer, fingerprint expert and are provided with a mobile laboratory. Their participation in the examination of the crime scenes have improved the criminal investigation tremendously.

4.5.11 Flying Squads

Most police organisations have instituted flying squads especially in large cities. A flying squad consists of a team of police officers who reach the scene of occurrence immediately and carry out preliminary duties. They have fast moving vehicles fitted with two-way communication wireless system. These squads are located at various important central points. They rush to the scene of occurrence on being informed about the occurrence. They control the situation temporarily and call in the concerned police.

Flying squads work round-the-clock in tandem. The flying squads of Delhi police are very well-organised. In many cases, the flying squads have caught the culprits red-handed. However, they have failed to meet the menace of rape incidents in the city.

The introduction of flying squads in cities has a great demoralizing effect on criminals. Well-organised squads have reduced crime.

4.6 EXPERT HELP

The experts help in handling the crime scene is becoming indispensable increasingly, especially in heinous crimes. The photographer, the medico-legal expert and the forensics experts are most useful and frequently needed. The main help they provide is given in the table below:

Table 4.1

Expert	Help
1. Photographer	**Photographer helps to** 1. Create -an accurate, complete and permanent record of the scene. 2. Fix the location of the scene, the *corpus delicti*, the evidentiary clues, the routes of ingress and egress, the movement of the culprit(s). 3. Record action. It helps to indicate the *modus operandi.* 4. Reveal the extent of depredation and damage. 6. Revive and bring the scene to the courtroom. 7. Reveal the hidden evidence. 8. Record the individual criminal's act in riots. 9. Photograph the dead, before, during and after the post-mortem to record evidence his identity and evidence thereon. 10. Use covert and trap cameras: (initiation through tripping, IR rays, making/breaking connections) and devices to automatic recording of the activity culprits at the specified scenes.

Expert	Help
	11. Provide photographic evidential help to medico-legal expert, forensic expert, Forensic psychologist and others involved, to locate, preserve and present evidence properly. 12. Record transient evidence. 13. Photograph invisible evidence through UV/IR rays.
2. Medico-legal Expert	The medico-legal is the most important expert in offences against the person, including murder. He helps to: 1. Identify whether the scene is real or fake. 2. Determine whether the victim is alive or dead. 3. Evaluate injuries whether they are old/recent, fatal/non-fatal, grievous/simple, self-inflicted or otherwise. He identifies the weapon used to inflict the injuries. 4. Identify age, sex, height, built of the victim. 5. Locate scars, deformity and tattoo marks. 6. Ascertain the cause of death, the time of death, and the number of persons who attacked him. 7. Discriminate whether the death is suicidal, accidental homicidal or natural death. 8. Verify whether the killing is in self-defence or murder. 9. Locate and help to collect evidence on the person of the deceased/injured: birthmarks, tattoo marks, GSR, projectiles, foreign matter, hair, fibres, blood stains, semen stains, nail scrapings, digital skin, body fluids as control samples and evidential material for narcotics, poisons. He also collects visceral and other material for detection of poisons, narcotics, alcohol. 10. Collect standard specimens of body materials like hair, blood, organs for comparison with corresponding crime clues. 11. Indicate the survival period after injury under the normal course. 12. Ascertain the possibility/impossibility of the acts the victim allegedly performed after injury. 13. Evaluate the symptoms observed in cases of suspected poisoning and give the name of the likely poison. 14. Find out whether the accused person is sane or insane (psychiatrist). 15. Determine the apparent motive: sex, maniac, vendetta, robbery from the injuries on the person of the victim. 16. Indicate whether the corpse was at one place or was taken from one place to another.

Expert	Help
3. Forensic Expert	The forensic expert can be dubbed as a "know-all" **(or Jack of all trades?)** in forensic science and in criminal justice system. If only one specialist is to join crime scene investigations, he is the first choice. A for A forensic expert helps the crime scene investigator to: 1. Ascertain if the incident is an Act of God, an accident, or a criminal act. 2. Establish genuine/fake nature of the alleged scene of the crime. 3. Help establish the identity of the deceased through occupational marks or materials, fingerprints DNA profiling. 4. Find if the *corpus delicti* has been moved from its original site. 5. Ascertain if a vehicle or a given vehicle has been used in the commission of the crime. If so, he determines the type of vehicle used and finds evidence to identify the vehicle involved. 6. Make quick evaluation of evidence for elimination or incrimination of the subject. 7. Help to locate, collect and preserve correct crime and sample clues. 8. Make the invisible clues visible, using UV, IR, X RAYS or chemicals. 9. Reconstruct sequence of events. 10. Verify versions. 11. Identify routes of ingress and egress. 12. Determine the nature of the weapon of offence. If a firearm has been used, its nature, the number of shots, direction and range of fire is given from the data in the medico-legal expert's report. Recovered exhibits also help. 13. Determine the motive of the crime: land, female, property and/ or revenge.

The above three types of experts are the pillars of scientific examination of a crime scene. Other specialists are required in certain special situations. They are:

- Fingerprint experts
- Footprint (track marks) experts
- Ballistics experts
- Toxicologists
- Explosive experts

- Computer specialists
- Constructional and electrical engineers
- Forensic psychologists

These experts should be on the panel of the investigating agencies, with their consent, and called for assistance whenever the need arises.

The forensic expert, at the crime scene is the indispensable necessity. Keeping in view his role at the scene many states in India have deployed scientists as mobile scientific crime scene officers. They attend important cases in their jurisdiction. They help to decide the need of other experts.

4. Police Dogs

The uncanny smelling power of dogs have made them very valuable in the examination of the crime scene. Trained dogs carry out the following duties:

1. **Guard the sites:** dogs have proved excellent guards. They guard buildings, compounds, parks and property.
2. **Track the criminals**: dogs have an uncanny power to detect scent and sound. A trained dog picks up scent of the culprit from those articles, which he/she may have touched/handled. It follows the criminal's route, adopted to his hideout.

   If the culprit has used some means of transport (horse, tonga, motor car or bus) the dog loses the scent and is unable to track. If the time interval between the flight of the culprit and the tracking is appreciable, the scent gets lost and the dog fails to follow the route. Rain, snow, storm and winds also destroy the scent.
3. **Identify criminal**: a culprit may leave some personal article at the scene. If it is kept in a closed container, the scent of the owner is preserved. If the dog is given the scent and is ordered to search the criminal among a number of persons, the dog is usually able to pick up the right person.
4. **Search Crime scene:** dogs have been trained to search the crime scene. They find out buried bodies, hidden items and articles, which may have escaped detection by the investigating officers.

   In Himachal Pradesh (India), some dogs have been trained to unearth unauthorised hidden distilleries and their products. Quite a few cases are, thus, literally unearthed.
5. **Explore Explosives**: Dogs have been trained to smell explosives. This aspect has proved particularly useful in checking air luggage to prevent aircraft sabotage. They also detect mines. Armed forces all over the world use dogs to detect mines and explosives.
6. **Locate Narcotics:** The dogs are used to detect narcotics. They have detected the drugs in special hiding places where it was difficult for human beings to detect. This aspect has proved useful to clear university campuses from drug menace.

   One late evening two police officers on a motorcycle began chasing a driver of a suspect car. After a chase through the streets of Paris, just as another police vehicle was about to overtake the suspect car, the offenders in the car fired at the police, seriously wounding one officer. One of the two offenders was arrested, but other although wounded by police in gunfire, managed to escape.

The police dog took up the trail at 4 o'clock in the morning starting off from the abandoned motor car, and led the police to the corner near a taxi rank. One of the taxi drivers stated that he had taken a wounded man to a town in the southern suburbs.

The dog was taken in a police van to this town. He took up the trail again from the place where the taxi driver had dropped the criminal. He stopped at the 10th floor of an apartment building, in front of a door where the police noticed bloodstains. The criminal was arrested. (CH)

Fig. 4.20

Artist's police dog in action

Research to capture the odour of the criminal left at the scene and to identify and compare the same through gas chromatography is going on. However, the work is yet not functional.

4.7 DOCUMENTATION OF CRIME SCENE

The police departments have realised the importance of documentation of a crime scene. They have organised various comprehensive forms to collect information. The various forms and their contents are given below they should cover most of the situations:

4.7.1 Worksheet

1. FIR No.?
2. Victim(s)?
3. Suspect(s)?
4. Scene of occurrence site?

5. Informer?
6. Date/Time of intimation?
7. Date/Time of arrival of the first police officer at the scene of occurrence?
8. Nature of the incidence?
9. Names of SIT (Scene Investigation Team) team and its leader?
10. Weather Conditions?
11. Expert help needed?
12. Date/Time of the start of processing?

4.7.2 Scene Description

1. *Victim*
   - Name, sex, age
   - Address, telephone
   - Community
   - Married/Unmarried
   - Deceased Identified
   - If yes, how accomplished
   - If no, how is it to be accomplished
2. *Next of kin*

   Record: as in (1)… first 3 items.
3. *Scene*
   - Address of the scene
   - Location
     (i) House
     (ii) Apartment
     (iii) Field
     (iv) Jungle
     (v) Other site
   - Genuine/Fake?
   - Arrival Date/Time
4. *Corpus delicti:* Condition/Position
5. Condition of body:
   - Place
   - Position
   - Fully clothed, partially clothed, unclothed/naked
   - Preservation: well-preserved, decomposed, putrefied
   - *Rigor mortis*: complete head, arms, legs
   - Lividity: front, back, sides, localized

- Color
- Blood: absent, present, location
- Ligatures marks

6. *Apparent wounds*:
   - None, gunshot wounds, stab, blunt force wounds
   - Number of wounds
   - Location: head, neck, chest, abdomen, extremities
   - Hanging
   - Weapon(s) used: type of gun, caliber, knife, others.
7. *Condition of surroundings*
8. *Odours*: body materials decomposition, other odours
9. *Evidence of last meal*: time, nature .
10. *Date/time indicators*: mail, newspapers, TV guide, milk bottles.
11. *Last contact of deceased:* date, name of the contact, type of contact.
12. *Evidence of robbery*.
13. *Evidence of drug abuse*: (prescription and non-prescription)

    If drug present, collect and send it along with the body to the medico-legal expert.
14. *Evidence of drug paraphernalia*: type
15. *Evidence of sexual deviant practices*:

    Type: collect and send the evidence along with body.
16. *Photographic Exhibits*
    - Limited number up to 6. Size 5″ × 7″, 8″ × 10″
    - Grotesque photographs impress!
17. *Injury Photographs*
    - From the scene of occurrence – police photographer
    - Before/after cleaning/after post-mortem examination/at the time of post-mortem. It is common now to prepare a video film of the postmortem process. The medico-legal expert should do it.
18. *Internal wounds*: describe, extract foreign material, seal and send for evaluation.
19. *Use/provide* only photocopies of all documents involved in all cases for daily use, to all concerned.
20. *Losses*
    a. Life
    b. Property
       - Cash
       - Ornaments
       - Crops
       - Household goods

4.7.3 Photographic Documentation

1. *Basics*
   - Proper record
   - Direction
   - Scale
   - Information/identification chit
   - Name of Investigating Officer/Photographer
   - Record of exposures
2. *Cameras:* digital or film
   - 35 mm
   - Video camera
3. *Photography*
   - Videography
   - Digital Photography
   - Aerial Photography
   - IR Photography
   - Stereo Photography
   - Photogrammetry
4. *Coverage.*
   (i) *Fix*:
      - Site
      - Scene of occurrence
      - *Corpus delicti*
      - Evidentiary clues

   (ii) Location (with markers if necessary)

   (iii) Identity
      - Ingress route: Point of entrance
      - Egress: Point of exit
      - Struggle marks
5. *Photographs of the scene of occurrence from the position of the witnesses to cover his view*
   - Cover/indicate odd act (s)
6. *Photography of crime in action*:
   - Riots
   - Demonstrations
   - Spying
   - Contraband business (drugs/arms/antiques)
   - Arson, fires
   - Burglaries

4.7.4 Sketch Documentation

1. *Two advantages*:
   - Inter-distances are available.
   - No crowding, relevant items only.
2. *Principles*
   - Direction showed
   - Distance measured
   - Scale indicated
   - At the scene
   - Legend – symbols
3. *Methods*
   - Co-ordinate
   - Extended co-ordinate
   - Polar Method

4.7.5 Evidence Recovery Log

1. *Equipment*
   - Magnifier
   - Scale, measuring tape
   - Recording/materials sketch
   - Containers
2. *Recovery log. See Appendix A*

4.7.6 Laboratory Submission Letter Format has

1. Proper reference number with date
2. A brief history of the case
3. FIR No. Copy of the FIR is attached in some cases.
4. Details of the exhibits (when, where, who, how) in each of the parcel
5. The identification marks on the exhibits
6. The number of seals used on each parcel.
7. The details of the contents of the each of the parcel separately
8. If more than one seals have been used, send corresponding specimens of all the seals.
9. If some preservative has been used, give the name and quantity used.
10. If specimen samples have been also sent, send their details.
11. Whenever a comparison is needed, always send the required samples. Send the specimens in separate packages.
12. If the exhibits (acids, volatile, fragile) need special handling, specify.

13. If the exhibits are likely to perish, disintegrate or putrefy and, hence, need immediate handling, stress the fact.
14. Give complete questionnaire about what sort of examination, comparison and evaluation you need.
15. Give the time frame about the exhibits:
    - When did the exhibits come into existence?
    - When were they packed?
    - The legal time frame for production of the exhibits and the report in the court?
16. Mention the name and rank of the messenger along with his attested signatures with whom the exhibits are sent.

4.7.7 Chain of Possession Log

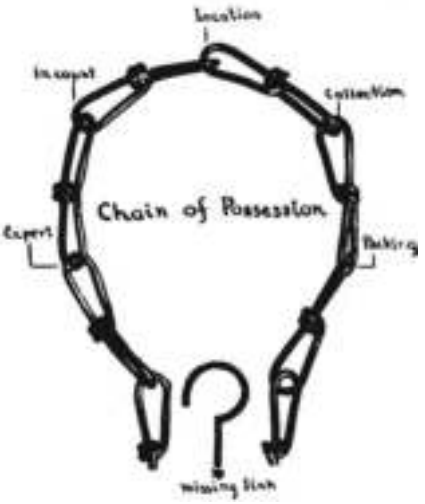

Fig. 4.21

Chain of Possession

"The scene is not the domain of any one person but of the whole team.
The body does not belong solely to the medico-legal expert any more than the bloodstains to the biologist or the pistol to the ballistics expert."

4.7.8 Broken Chain of Possession

Ensure that the possession of the exhibits is known from the time it is taken into possession to the time it is produced in the court. A proper record of the movement of the exhibits is kept in a possession Log. In fact, only sealed exhibits move and the transfer from one man to another takes place under signatures of the sealed parcel.

APPENDIX A

EVIDENTIARY CLUES

EVIDENCE CHART

1. Location	2. Date	3. Case (FIR No.)	4. P.S.		5. Investigator(s)		

Sl. No.	Evidence	Material	Quantity	Container	Seals	Witnesses	Remarks
1.	**Body Fluids:** Bloodstains, liquid blood, objects, scrapes, semen, semen stains, urine, saliva, milk, perspiration, vaginal swab or secretion, sputum, vomitus, purge.						
2.	**Corpses:** Body, body parts, bones, hair, skin, flesh, teeth, nails, viscera, intestines, muscles, kidney, liver, ear and other organs.						
3.	**Documents:** Registers, account books, cheques, receipts, bills, files, books, applications, letters, forms, pens, carbon papers, typewriters, sealing wax seals, stamps erasers, photographs and other objects.						
4.	**Explosives:** Exploded products, fuses, tins, explosive devices, photographs, objects.						
5.	**Fibres:** Hairs, fibres, strings, ropes, thread, cloth, clothes, rags, leaves and wood.						
6.	**Fingerprints:** Objects, photographs, lifts, prints.						
7.	**Firearms:** Bullets, pellets, wads, gunpowder, objects bearing bullet holes or powder residue marks, photographs, post-mortem reports, guns, their parts, ammunition live fired cartridges.						
8.	**Fires:** Inflammables, containers, matches, odd objects, dust, dirt, photographs and sketches.						
9.	**Foot and Footwear marks:** Photographs, moulds, lifts, footwear objects.						
10.	**Liquors:** Blood, urine, breath, liquor, bottles, tumblers, lahn.						
11.	**Poisons:** Bottles, containers, capsules, pills, powders, seeds, leaves, bark, food, fruit, liquor, sweetmeats, tumblers, vomitus, purges, viscera, intestines, body parts, bones, hair, nails, muscles, blood, urine, saliva.						
12.	**Tools:** Object, photographs, lifts, tools, jimmies, knives, spades, spears, swords.						
13.	**Vehicles:** Broken or separated parts, broken glass, paints, grease, oil, stains, skid marks, other objects, blood or urine sample for drunkenness, papers.						
14.	**Miscellaneous:** Ash, buttons, bricks, cigarettes, soil.						

4.8 ADDITIONAL READING

1. Sharma, BR. 2017. *Scientific Criminal Investigation, LexisNexis*/Universal Publishers.
2. Philippine National Police Manual on Investigation of Crime. Internet.

4.9 CASE LAW

(Supreme Court case-21st Century)

4.9.1 Tracker Dog Evidence not proved Scientific[3]

Author's Summary

The importance of police dogs has been realised by all concerned. The Supreme Court, in this case, has ruled that the police may utilize the dogs for their investigations. However, as they are mute witnesses and cannot be examined/cross-examined, their evidence the courts cannot use it.

Highlights italicised

4.9.2 Relevant Extracts (Verbatim)

One of the main contentions advanced by the learned counsel is that the evidence pertaining to the sniffer dog is so fragile that no adverse inference could be drawn against the appellant on the strength of the said evidence. PW-8 is the police constable who deployed the police dog "Raja" for the purpose of tracking down the culprits of this murder. PW-8 said that police dog was brought to the place of occurrence on 15-4-1993 and that dog after smelling the blood, bloodstained handkerchief, a knife and a belt which were strewn on the floor near the dead body, began its pursuit in search of the hideout of the culprits or where the body was stashed away. The track, which the terrier followed thereafter, has been narrated by PW-8 in his evidence. The terminus of the track was the house of the appellant.

The uncanny smelling power of canine species has been profitably tapped by investigating agencies to track the culprits. Trained dogs can pick up the scent from the scene of any object and trace out the routes through which the culprits would have gone to reach their hideouts. Developing countries have utilised such sniffer dogs in a large measure. In India also, the utilisation of such tracker dogs is on the increase. Though such dogs may be useful to the investigating officers, can their movements be of any help to the court in evaluating the evidence in criminal cases?

A four-fold criticism is advanced against the reception of such evidence.

1. *First is, it is not possible to test the correctness of the canine movements through the normal method available in criminal cases, i.e. in cross-examination.*
2. *Second is that the life and liberty of human beings should not be made to depend on animal sensibilities.*
3. *Third is that the possibility of a dog misjudging the smell or mistaking the track cannot be ruled out, or many a times such mistakes have happened.*
4. *Fourth is that even today the science has not finally pronounced about the accuracy of canine tracking.*

3. *Gade Lakshmi Mangaraju v State of Andhara Pradesh,* AIR 2001 SC 26677 : 2001 Cr LJ 3317 (SC).

There are basically three kinds of police dogs – the tracker dogs, the patrol dogs and sniffer dogs. Recent trends show that hounds belonging to certain special breeds sheltered in specialised kennels and imparted with special training are capable of leading investigating agency to very useful clue in crime detection and thereby help detectives to make a breakthrough in investigation. English courts have already started treating such evidence as admissible. In Canada and in Scotland such evidence has become, of late, admissible though in the United States the position is not uniform in different States.

The weakness of the evidence based on tracker dogs has been dealt with in an article "Police and Security Dogs".

> *The possibility of an error on the part of the dog or its master is the first among them. The possibility of misunderstanding between the dog and its master is close to its heels. The possibility of a misrepresentation or a wrong inference from the behaviour of the dog could not be ruled out. The last, but not the least, is the fact that from a scientific point of view, there is little knowledge and much uncertainty as to the precise faculties which enable police dogs to track and identify criminals. Police dogs engage in these actions by virtue of instincts and also by the training imparted to them.*

We will now refer to two decisions of this court in which the evidence relating to sniffer dogs movement have been tested.

In *Abdul Razak Murtaza Dafadar v State of Maharashtra*, AIR 1970 SC 283 : 1970 Cr LJ 373 : (1970) 1 SCR 551, a three-Judge Bench of this court declined to express any concluded opinion or to lay down any general rule with regard to tracker dog's evidence or its admissibility against the accused, as it was not necessary to do so on the fact situation. However, their Lordships made the following observations on the usefulness or otherwise of such evidence (Para 11):

> *It was argued that the tracker dog's evidence could be likened to the type of evidence accepted from scientific experts describing chemical reactions, blood tests and the actions of bacilli. The comparison does not, however, appear to be sound because the behaviour of chemicals, blood corpuscles and bacilli contains no element of conscious volition or deliberate choice. But dogs are intelligent animals with many thought process similar to the thought processes of human beings and wherever you have thought processes there is always the risk of error, deception and even self-deception. For these reasons we are of the opinion that in the present state of scientific knowledge evidence of dog tracking, even if admissible, is not ordinarily of much weight.*

In *Surinder Pal Jain v Delhi Administration*, AIR 1993 SC 1723 : 1993 AIR SCW 1561 : 1993 Supp (3) SCC 681 : 1993 Cr LJ 1871, a two-Judge Bench expressed the opinion that "the pointing out by the dogs could as well lead to a misguided suspicion that the appellant had committed the crime, so their Lordships sidelined that item of evidence from consideration.

We are of the view that criminal courts need not bother much about the evidence based on sniffer dogs due to the inherent frailties adumbrated above, although we cannot disapprove the investigating agency employing such sniffer dogs for helping the investigation to track down criminals.

Investigating exercises can afford to make attempts or forays with the help of canine faculties but judicial exercise can ill afford them.

4.9.3 Identification of accused by sniffer dog[4]

Author's Summary

Since nobody was named in the FIR, the Investigating Officer took the help of the dog squad and the dog handler. Dog tracking proceeding was done and the dog tracked the accused. The accused who was then taken into custody gave statement regarding commission of crime. Though the statement was not admissible, at his instance the sickle as well as blood stained cloths were recovered. The report proved that the sickle was blood stained. The Doctor has given statement that the injury caused upon the victim could have been caused by the weapon so recovered which establish that the said weapon was used in committing the murder. Father of the victim had given statement that earlier the accused eve-teased his daughter for which his nephew scolded accused. There is no evidence to suggest that the father of the deceased had any enmity or grudge with anyone who may be suspected to have committed the murder. All these circumstances proved that it is nobody else but the accused who attempted to commit rape and murdered the deceased.

4.9.4 Relevant Extracts (Verbatim)

It urged on behalf of the appellant that identification of accused by sniffer dog cannot be relied upon as it is not admissible in order to prove the guilt of the appellant.

In *Dinesh Borthakur v State of Assam,* (2008) 5 SCC 697, this Court held:

"the law in this behalf is settled that while the services of a sniffer dog may be taken for the purpose of investigation, its faculties cannot be taken as evidence for the purpose of establishing the guilt of an accused."

In the present case, the services of a sniffer dog was taken for investigation. The said dog traced the accused and he was formally arrested in the evening of the next day. The Investigating Officer, Ashok Kumar Yadav (PW-10) corroborated the evidence of Abdul Lais Khan (PW-4) to the effect that "'Raja"' sniffer dog after picking up scent from the place of occurrence tracked down the house of the accused. What is relevant to note is that the accused has not been convicted on the ground that the sniffer dog tracked down the house of the accused and barked at him. The evidence of dog tracking only shows how the accused was arrested. The Trial Court and the Appellate Court noticed the motive of the accused. Ram Chandra Chaurasiya (PW-1) disclosed in his evidence that a few days before the date of occurrence, the accused has teased his daughter and also threatened her.

Her daughter Km."x" complained about the misconduct of the accused to her cousin Ashok Kumar and the latter admonished the accused for the same. Ashok Kumar died subsequently but the evidence of the girl's father is quite convincing and worthy of credit. The aforesaid incident clearly reflects upon the motive of the accused. The prosecution has brought on record evidence as to string of her trouser was found untied and the trouser had been taken down. She was lying naked when found dead. The scene at the site of occurrence indicates that the trouser of the deceased had been taken down with a view to outrage her modesty.

A portion of her dupatta was found thrust in her mouth so as to gag her. The other part of the dupatta was found in the incised wound on the neck so as to soak blood. The pair of the chappals of the deceased was lying at a distance. The wheat plants were noticed to be trampled which indicates violence and a scuffle between the victim and the assailant. The

4. *Lalit Kumar Yadav v State of Uttar Pradesh,* Criminal Appeal No, 1022 of 2006, decided on 25 April 2014 (SC).

episode of eve-teasing of the girl indicates that the accused wanted sex with her and it was in this background that he made a forcible attempt to rape her. It appears that the girl was bold and brave and she resisted the accused forceful attempt which enraged and provoked the accused to eventually commit the heinous act. Since there is no direct evidence to prove the guilt of the accused the Trial Court and the Appellate Court considered the circumstances which led towards the accused?

Admittedly, nobody was named in the FIR but referring to the incident that Km. "x" was murdered the FIR was lodged. Since nobody was named in the FIR the Investigating Officer took the help of the dog squad and the dog handler Abdul Lais Khan (PW-4) came with the dog. Dog tracking proceeding was done and the dog tracked the accused. The said fact is not disputed. The accused who was then taken into custody gave a statement regarding the commission of crime. Though the statement is not admissible, at his instance the sickle as well as blood stained cloths were recovered. The report proved that the sickle was blood stained. The Doctor has given statement that the injury caused upon the victim could have been caused by the weapon so recovered which establish that the said weapon was used in committing the murder.

Ram Chandra Chaurasiya (PW-1) father of the victim had given statement that earlier also the accused eve-teased his daughter Km. "x" for which his nephew Ashok Kumar scolded accused. Ram Prakash (PW-3) although turned hostile had made statement that accused had confessed to him that since the girl has refused sexual relationship with him he had murdered her. Though such statement cannot be relied upon independently to hold the accused guilty, other chain of evidence reaches to only one conclusion, i.e., against the accused. Recovery of a handkerchief from the place of murder, with the mark of "Heart" and inscription of the words "I Love You", establishes that some person was close to her.

The position of her cloth of the lower body "salwar" establish that the person tried to have sex with the girl and the injuries on the fingers of the girl also established that she protested somehow. These circumstances also lead to the conclusion that the person who could not succeed in outrage the modesty of the girl, murdered her. There is no other evidence contrary to it. Further, there is no evidence to suggest that the father of the deceased had any enmity or grudge with anyone who may be suspected to have committed the murder. All these circumstances proved that it is nobody else but the accused who attempted to commit rape and murdered the deceased Km."x".

4.10 ADDITIONAL CASE LAW

4.10.1 Police Dogs Identification[5]

During the investigation, the assistance of tracker-dog "Kumar" was used by the police and the bag and clothes of the accused were recovered with the assistance of this tracker-dog, who also led the police to the house of the accused. The admissibility of this evidence and, more importantly, the evidentiary value of dog-tracking evidence has been seriously questioned and, therefore, requires to be examined and the issues decided. Investigating agencies often use the services of tracker-dogs and the question, therefore, arises as to how reliable is this class of evidence. The orthodox view was that though it is admissible, it is not of much utility and, consequently, that it did not ordinarily have such weight.

There has been considerable development of research and thinking on the subject and the modern trend is that such evidence is of an extremely high calibre.

5. *Babu Mughal Sheikh v State of Maharashtra,* 1993 Cr LJ 2808 (SC).

Undoubtedly, evidence in criminal cases, and in particular ones where the charges are serious, must pass the dual tests of absolute reliability and infallibility. That a tracker-dog cannot be influenced is something strongly in its favour and what lends this class of evidence a special blend of acceptability.

On the question of margin of error, experience has shown that the special skills of a tracker dog outclasses all other forms of detection; even sophisticated gadgetry. It is now universally acknowledged that in detecting drugs, where every other form of human ingenuity and gadgets are capable of being eluded, that it is virtually impossible to avoid detection when a trained tracker-dog is used, explaining why this mode is found to be the most reliable and fool-proof. Similar has been the experience in cases of robbery, murder, and the like where the scent is fresh and the area not too crowded. Statistics has shown that in many cases dogs have been unsuccessful in detection due to limiting factors, but that wherever they have tracked down an object or a culprit the dog was never wrong. Such evidence will, therefore, have to be categorised as being of the highest order and reliability.

This is one of the few cases in which the services of a tracker-dog had been utilised. The police brought one of the dogs by the name of Kumar to the scene of offence and it is alleged that a dagger was found at the scene stained with blood. It is further alleged that on the basis of the scent which the dog picked up at that place, that the dog went to the field of the accused and pointed out to the police the bag and the *Khaki* coat belonging to the present accused, both of which were recovered from that spot. It is also alleged that the dog led the police to the house of accused No. 1. This evidence is acceptable in view of the position in law that such evidence is in fact admissible.

Mr. Vaidya had attacked both the admissibility and the evidentiary value of the dog-tracking evidence. It is seldom that this issue has been raised before the courts and the only reported decision on the point, wherein the Supreme Court had occasion to refer, only in passing to such evidence, is in the case of *Abdul Razak Murtaza Dafadar v State of Maharashtra*[6]. While dealing with this question, their Lordships had occasion to observe as follows:—

> *The tracker-dog's evidence cannot be likened to the type of evidence accepted from scientific experts describing chemical reactions, blood tests and the actions of bacilli, because the behaviour of chemicals, blood corpuscles and bacilli contains no element of conscious volition or deliberate choice. Dogs are intelligent animals with many thought processes similar to the thought process of human beings and wherever there are thought processes there is always the risk of error, deception and even self-deception.*

Considerable research has been done on the subject. It is necessary to point out that in Canada and Scotland, evidence of dog-tracking is admitted and relied upon by the courts. As far as the United States is concerned, the position is conflicting insofar as the courts have placed reliance on such evidence in some cases, but have rejected it in others. Dog-tracking evidence is admissible in England and in criminal trials it is often used by the prosecution. There are certain safeguards which need to be borne in mind in such cases. The position as it obtained formerly is illustrated in the following passage from the case of *R v Montgomery,* 1866 NI 100:—

> *There are three objections which are usually advanced against the reception of such evidence.*
>
> First*, since it is manifest that the dog cannot go into the witness box and give his evidence on oath, and consequently submit himself to cross-examination, the dog's human companion must go into the box and report the dog's evidence, and this is clearly hearsay.*
>
> Secondly*, there is a feeling that in criminal cases the life and liberty of a human being should not be dependent on canine inferences. And*

6. *Abdul Razak Murtaza Dafadar v State of Maharashtra*, AIR 1970 SC 283 : (1970) 1 SCR 551 : 1970 Cr LJ 373.

> Thirdly, *it is suggested that even if such evidence is strictly admissible under the rules of evidence, it should be excluded because it is likely to have a dramatic impact on the jury out of proportion to its value.*

Subsequently, however, the position has been quite unambiguous and has changed drastically. What the courts have insisted upon is that the evidence must pass the test of scrutiny and reliability as in the case of any other evidence. The following guidelines must, however, be borne in mind:—

> *(a) That there must be a reliable and complete record of the exact manner in which the tracking was done and to this extent, therefore, in this country, a panchnama in respect of the dog-tracking evidence will have to be clear and complete. It will have to be properly proved and will have to be supported by the evidence of the handler.*
>
> *(b) It will be essential that there are no discrepancies between the version as recorded in the panchnama and the evidence of the handler as deposed to before the court.*
>
> *(c) The evidence of the handler will have to independently pass cross-examination.*
>
> *(d) The material will have to be placed before the court by the handler, such as the type of training imparted to the dog, its past performance, achievements, and reliability, supported, if possible and available, by documents.*

It is scientifically accepted that dogs are rated as extremely intelligent animals and that some of their sensibilities are very highly developed and are extremely reliable. It is also to be noted that there are some breeds of dogs and some strains that are specially utilised for hunting and tracking because of their abnormally high talents, *if the dog belongs to one of these categories and if it is shown to the court that it has been specially trained for purposes of detection, not only would the dog-tracking evidence will be admissible, but it will have to be relied upon as being evidence of a very high calibre.*

4.10.2 Location of the Scene[7]

We also find that the trial court as well as the High Court had brushed aside the objection that the blood recovered from the place of occurrence was not sent for chemical examination. *We think that a failure of the police to send the blood for chemical examination in a serious case of murder, such as the one before us, is to be depreciated. In such cases, the place of occurrence is often disputed. In the instant case, it was actually disputed.* However, such an omission need not jeopardise the success of the prosecution case where there is other reliable evidence to fix the scene of occurrence.

4.10.3 No Blood at the alleged Scene[8] (Fake Scene)

The accused was said to have speared the deceased in the abdomen and on the left thigh, as a result of which the deceased fell down on the spot (in the street) with his back downwards. *In acquitting the accused, the Sessions Judge was much impressed with the circumstance that there was no explanation as to why there was no blood at the spot. The Sessions Judge was not satisfied that the occurrence took place at the place sworn by the P.Ws.* The evidence shows that although two injuries were caused and one of the questions which had been raised by the defence was that there was no blood at the spot, no attempt was made by the prosecution to show the reason why there was no blood at the spot. There was also no blood on the cot on which the dead body was lying nor a trail of blood to the house.

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7. *Raghunandan v State of Uttar Pradesh*, AIR 1974 SC 463 : (1974) 4 SCC 186 : 1974 Cr LJ 453 (SC).
8. *State of Punjab v Bihari Lal Pahu Lal*, AIR 1953 P&H 218.

4.10.4 Preservation and Guarding of the Scene[9]

Exhibits 2/1 and 2/2 are enlargements of photos taken of the impressions on the wall of the room. They were prepared by the photographer Ghose who went to the spot on the 4th April in order to take the photograph. The photograph was taken in the presence of the senior fingerprint expert, R.N. Sinha and the investigating officer, K.B. Karan (P.W. 25). The impressions were seen *'in situ'* by the Sessions Judge (*vide* his note of memorandum of local inspection at page 52 of the paper book) and were then scraped by assistant sub-inspector Rajmani Lal (P.W. 26) who himself took them to the chemical examiner for chemical analysis. The result of the chemical analysis was that they were both found to contain blood and the print on the eastern side of the door corresponding to the enlargement Ext. 2(1) was found to contain human blood. The blood in the other impression, which was a very small one, was found to have disintegrated and so its origin could not be determined. In view of the evidence set out there is no difficulty in connecting the enlargements (2/1) and (2/2) with the impressions on the wall of the room of Anand Prakash.

Great stress has been laid on the fact that the impressions were not discovered till the 4th of April. It appears from the evidence, however, that they could only be seen in the light of a flood lamp as the room was badly lit. In this connection, our attention was drawn to the fact that photographer Ghose took some photographs on the 28th of February at the spot and it is suggested that he did have a flood lamp with him that day. This cannot be correct because Ghose himself deposes:

> *I could not take photos inside this house as the light was not sufficient, but I took some photos of some footprints on the ground of the room of the house.*

The question of insufficient light could not have arisen if a floodlight was available. All that happened on the first day probably was that the photographer took photographs of footprints in portions of the room which were better lit than the remainder of the room.

Suggestions have been made to the fingerprint expert, R.N. Sinha, in the course of cross-examination about the possibility of transferring finger impressions on the walls of the house in order to falsely implicate a suspect person and it is urged that the appellant Karu was a prisoner and prints of his fingers and palms had been taken when the discovery was made. *It is in evidence, however that from the very first the investigating officer put the room in which the occurrence had taken place under seal and throughout the investigation he had a constable continually on duty guarding the room. There is, therefore, no reason to think that the impressions found on the wall were impressions fraudulently placed there in order to implicate Karu Gope.*

4.10.5 Identity of the Scene[10]

It was argued with great vehemence in the High Court as well as in the Court of Sessions that there was trail of blood from the front door of the house of the Vakil into the corridor rooms marked H and H-l in the plan and that supported the defence theory that the deceased Kanan received the stab injuries not in or near the house in question but somewhere far away near the railway station. The High Court took the view that if Kannan had received the injuries somewhere outside the house it was impossible for him to have come into the room in view of the doctor's evidence.

> *It was concluded on the material placed on the record that there could be no room for doubt that Kannan received the injuries in the room itself and not outside, and that he was carried out*

9. *State of Bihar v Karu Gope*, AIR 1954 Pat 131 : 1953 BLJR 488 : 1954 Cr LJ 201 (Pat).
10. *Marachalil Pakku v State of Madras*, AIR 1934 SC 648 : 1954 Mad WN 670 : 1954 Cr LJ 1668 (SC).

of the room while life was still lingering and therefore there would be dripping of blood from the body during the course of transit as the injuries were very serious and vital arteries had been cut.

4.10.6 Manipulation of the Scene[11]

P.W. 1, Tabedar Khan, the investigating officer, stated that on the day of occurrence he searched carefully the walls of Kanhaiyalal's shop as also the ground in front of his house but did not find any bullets and that if they had struck the plinth or the wall of Kanhaiyalal's shop or any shop close by, the bullets ought to have been recovered as the place itself was such that they could not have been lost.

To the same effect is the statement of the ballistics expert who saw the place of occurrence and gave the opinion that judging the direction of firing and the position of Bhagwati at that time, the bullets should have been found somewhere near the scene of occurrence and that they could not just disappear in the air.

The fact that the bullets were not found only makes it doubtful whether, if the revolver had been fired, the firing was in the circumstances and in the direction deposed to by the prosecution witnesses.

There is also no evidence to indicate that the ground in front of Kanhaiyalal's shop was so soft that it was very easy for a bullet to get embedded deep into the ground and that it was, therefore, difficult and impossible to disenter it from the ground. On the other hand, the evidence is that the road in front of Kanhaiyalal's shop was a metalled road and that the ground very close to his shop was a hard one.

Coming now to the production in evidence of a picture with a broken glass as an article which was hit by one of the shots fired by the respondents and found embedded in a Balli, we have formed the same opinion as the learned Sessions Judge did of that evidence being false and manipulated. At the time of the incident the picture was just above door in a wall some ten feet behind the spot where Bhagwati was. It was decorated by a paper garland.

It is said that one of the shots fired by the accused person struck the glass plate covering the picture causing a hole therein and at a corresponding place in the picture and the bullet then pierced the wooden beam behind the picture. According to the prosecution, the damage done to the picture was first noticed on 7 December 1955, by Kanhaiyalal when he was cleaning the picture. While cleaning he found a hole in the glass and the hole was covered by tassels of a paper garland which, contrary to the usual mode of putting garland, were on the top.

He accordingly informed the police, of what he had seen and after the arrival of the police, the bullet was removed from the beam. Now, it is in evidence that immediately after the occurrence Tabedar Khan and several other police officers including a Deputy Superintendent of Police closely inspected the scene of occurrence and the wall where the picture was hung. But none of them found any bullet or any mark of the striking of any bullet. Tabedar Khan, the investigating officer is very-very emphatic on the point.

Tabedar Khan did not find any crack or hole or anything odd in the picture when he inspected it. If, then on 22 November 1955, Tabedar Khan and other police officers did not find any hole and even cracks in the glass which Kanhaiyalal, the sub-inspectors Bhadora and Narendra Singh and the witnesses P.W. 9 Shankerlal and P.W. 19 Nathu, saw on 7 December 1955, it is impossible to hold that the damage to the picture was caused on 22 November 1955, itself by the striking of a bullet.

It is beyond our comprehension as to how the bullet according to the prosecution pierced the glass and got embedded in the beam behind it, did not, when it struck the glass, make any

11. *State of Madhya Pradesh v Babulal Ramratan*, AIR 1958 MP 55 : 1958 Cr LJ 190 (MP).

sound and reduce the glass to splinters or at least break it into pieces. It is also strange that no one heard sound of the striking of the bullet. It is not the suggestion of the police that the glass-plate covering the picture was of a special kind in which a bullet could be fired noiselessly causing only a hole and no other damage.

In his evidence Major Sonaone said that the striking of the bullet on the glass-plate covering the picture would create considerable sound and that if the hole in the picture was covered by a garland it should also have been damaged and disturbed. But the garland was found without any damage and no one heard the sound of the striking of the bullet and no one saw any glass pieces falling on the ground.

It is worthy to note that the glass-plate containing the hole was not sent to Major Sonaone for examination. It was not produced in the case. There is no mention of a broken glass containing a hole in the seizure memo. It refers only to the glass as one broken at the top. The production of the pieces of glass containing a hole would have indicated whether any pieces of broken glass would or would have not fallen on the ground after the striking of the bullet.

Learned government-advocate contended that Kanhaiyalal's shop being an open place it was impossible to implant a bullet in the beam behind the picture or fire a shot at the picture. As to this it is sufficient to say that the possibility of an expert hand firing a shot at the picture in the quiet hours for the purpose of creating evidence cannot be ruled out in this case. *Such being the circumstances in which the picture was found and the bullet was recovered from a beam on 7 December 1955, we are driven to the conclusion that this evidence of one of the shots hitting the picture and a bullet getting embedded in the beam behind it is a fabrication from start to finish.*[12]

4.10.7 Clues: Location, Collection, Chain of Custody[13]

It has been pointed out that the '*hasua*' was not shown to the photographer for identification in court. There is, however, sufficient evidence, as I have indicated, to connect the enlargement Ext. 2 with the impression on the '*hasua*' in question. This cannot be said about the enlargement Ext. 3 which is said to be an enlargement of the photo of the bloody footprint seized from the room of the deceased Anand Prakash on 8-3-1951. All that the photographer Ghose says about this photograph is:—

I took photos of papers having footprints. This is a negative of this footprint. (Ext. 4) and this is the enlarged photo of this negative (Ext. 3)..... I got the paper containing the footprint.

Neither the investigating officer nor any of the officers of the criminal investigation department tells us how the paper containing the footprint came into the possession of photographer Ghose for this purpose, and there is no evidence to identify paper with the paper that was seized on the 8th of March. That paper is said to have been sent to the chemical examiner and the chemical examiner's report with the paper has disappeared. It is, therefore, not possible to connect with the occurrence the paper from which the enlargement Ext. 3 has been prepared and this document is of no value as connecting Bhorik with the occurrence.

4.10.8 Police Dogs Identification[14]

Tracker-dog's evidence reliable "being of extremely high caliber"

> During the investigation, the assistance of tracker-dog 'Kumar' was made use of by the police and the bag and clothes of the accused were recovered with the assistance of this tracker-dog, who also led the police to the house of the accused. The admissibility of

12. *State of Madhya Pradesh v Babulal Ramratan*, AIR 1958 MP 55 : 1958 Cr LJ 190 (MP).
13. *Abdul Rajak Murtaja Dafedar v State of Maharashtra*, AIR 1970 SC 283 : (1970) 1 SCR 551 : 1970 Cr LJ 373.
14. *Babu Mughal Sheikh v Stat of Maharashtra,* 1993 Cr LJ 2808 (SC).

> this evidence and, more importantly, the evidentiary value of dog-tracking evidence has been seriously questioned and, therefore, requires to be examined and the issues decided. Investigating agencies often use the services of tracker-dogs and the question, therefore, arises as to how reliable is this class of evidence. The orthodox view was that though it is admissible, it is not of much utility and consequently, that: did not ordinarily have such weight. *There has been considerable development of research and thinking on the subject and the modern trend is that such evidence is of an extremely high calibre.*
>
> Undoubtedly, evidence in criminal cases, and in particular ones where the charges are serious, must pass the dual tests of absolute reliability and infallibility. That a tracker-dog cannot be influenced is something strongly in its favour and what lends this class of evidence a special blend of acceptability. On the question of margin of error, experience has shown that the special skills of a tracker dog outclass all other forms of detection; even sophisticated gadgetry. It is now universally acknowledged that in detecting drugs, where every other form of human ingenuity and gadgets are capable of being eluded, that it is virtually impossible to avoid detection when a trained tracker-dog is used, explaining why this mode is found to be the most reliable and fool-proof. Similar has been the experience in cases of robbery, murder and the like where the scent is fresh and the area not too crowded. Statistics have shown that in many cases dogs have been unsuccessful in detection due to limiting factors, but that wherever they have tracked down an object or a culprit that the dog was never wrong. Such evidence will, therefore, have to be categorised as being of the highest order and reliability.

This is one of the few cases in which the services of a tracker-dog had been utilised. The police brought one of the dogs by the name of Kumar to the scene of offence and it is alleged that the dagger was found at that spot stained with blood. It is further alleged that on the basis of the scent which the dog picked up at that place, that the dog went to the field of the accused and pointed out to the police the bag and the Khaki coat belonging to the present accused, both of which were recovered from that spot. It is also alleged that the dog led the police to the house of accused No. 1. This evidence is acceptable in view of the position in law that such evidence is in fact admissible.

Mr. Vaidya has attacked both the admissibility and the evidentiary value of the dog-tracking evidence. It is seldom that this issue has been raised before the courts and the only reported decision on the point, wherein the Supreme Court had occasion to refer, only in passing to such evidence, is in the case of *Abdul Razak Murtaza Dafadar v State of Maharashtra*[15]. While dealing with this question, their Lordships had occasion to observe as follows:—

> *The tracker-dog's evidence cannot be likened to the type of evidence accepted from scientific experts describing chemical reactions, blood tests and the actions of bacilli, because the behaviour of chemicals, blood corpuscles and bacilli contains no element of conscious volition or deliberate choice. Dogs are intelligent animals with many thought processes similar to the thought process of human beings and wherever there are thought processes there is always the risk of error, deception and even self-deception.*

Considerable research has been done on the subject. It is necessary to point out that in Canada and Scotland, evidence of dog-tracking is admitted and relied upon by the courts. As far as the United States is concerned, the position is conflicting insofar as the courts have placed reliance on such evidence in some cases, but have rejected it in others. Dog-tracking evidence is admissible in England and in criminal trials it is often used by the prosecution. There are certain safeguards which need to be borne in mind in such cases. The position as it

15. *Abdul Razak Murtaza Dafadar v State of Maharashtra,* AIR 1970 SC 283 : (1970) 1 SCR 551 : 1970 Cr LJ 373.

obtained formerly is illustrated in the following passage from the case of *R v Montgomery,* 1866 NI 100:—

> *There are three objections which are usually advanced against the reception of such evidence.* First*, since it is manifest that the dog cannot go into the witness box and give his evidence on oath, and consequently submit himself to cross-examination, the dog's human companion must go into the box and report the dog's evidence, and this is clearly hearsay.* Secondly*, there is a feeling that in criminal cases the life and liberty of a human being should not be dependent on canine inferences. And Thirdly, it is suggested that even if such evidence is strictly admissible under the rules of evidence, it should be excluded because it is likely to have a dramatic impact on the jury out of proportion to its value.*
>
> Subsequently, however, the position has been quite unambiguous and has changed drastically. What the courts have insisted upon is that the evidence must pass the test of scrutiny and reliability as in the case of any other evidence. The following guidelines must, however, be borne in mind:—
>
> (a) That there must be a reliable and complete record of the exact manner in which the tracking was done and to this extent, therefore, in this country, a *panchnama* in respect of the dog-tracking evidence will have to be clear and complete. It will have to be properly proved and will have to be supported by the evidence of the handler.
>
> (b) It will be essential that there are no discrepancies between the version as recorded in the *panchnama* and the evidence of the handler as deposed to before the court.
>
> (c) The evidence of the handler will have to independently pass cross-examination.
>
> (d) The material will have to be placed before the court by the handler, such as the type of training imparted to the dog, its past performance, achievements, reliability, supported, if possible and available, by documents.
>
> It is scientifically accepted that dogs are rated as extremely intelligent animals and that some of their sensibilities are very highly developed and are extremely reliable. It is also to be noted that there are some breeds of dogs and some strains which are specially utilised for hunting and tracking because of their abnormally high talents, *if the dog belongs to one of these categories and if it is shown to the court that it has been specially trained for purposes of detection, not only would the dog-tracking evidence will be admissible, but it will have to be relied upon as being evidence of a very high calibre.*

4.10.9 Tracker Dog's Lacunae[16]

It was lastly urged on behalf of the appellant that the lower courts ought not to have relied upon the evidence of dog tracking and such evidence was not admissible in order to prove the guilt of the appellant. The evidence of tracker dogs has been much discussed. In Canada and Scotland it has been admitted. But in the United States there are conflicting decisions:

> *There have been considerable uncertainty in the minds of the courts as to the reliability of dogs identifying criminals and many conflicts of opinion on the question of the admissibility of evidence. A survey of the cases, however, reveals that most courts in which the question of the admissibility of evidence of trailing by blood hounds has been presented to take the position that upon a proper foundation being laid by proof that the dogs were qualified to trail human beings and that the circumstances surrounding the trailer were such as to make it probable that the person trailed was the guilty party, such evidence is admissible and may be permitted to go to the jury for what it is worth as one of the circumstances which may tend to connect the defendant with the crime. [Para 378, Am. Juris, 2nd Edn., Vol. 29, p. 429].*

16. *Abdul Razak Murtaza Dafadar v State of Maharashtra*, AIR 1970 SC 283 : (1970) 1 SCR 551 : 1970 Cr LJ 373.

There are three objections which are usually advanced against the reception of such evidence.

1. *First*, since it is manifest that the dog cannot go into the box and give his evidence on oath, and consequently submit himself to cross-examination, the dog's human companion must go into the box and report the dog's evidence and this is clearly hearsay.
2. *Secondly*, there is a feeling that in criminal cases the life and liberty of a human being should not be dependent on canine inferences.
3. *Thirdly*, it is suggested that even if such evidence is strictly admissible under the rules of evidence it should be excluded because it is likely to have a dramatic impact on the jury out of proportion to its value.

In *R. v Montgomery,* 1886 NI 160*,* a police constable observed men stealing wire by the side of a railway line. They ran away when he approached them. Shortly afterwards the police got them on a nearby road. About an hour and half later the police tracker dog was taken to the base of the telegraph pole and when he had made a few preliminary sniffs he set off and tracked continuously until he stopped in evident perplexity at the spot where the accused had been put into the police car. At the trial it appeared that other evidence against the accused that they had been stealing the wire was inconclusive and that the evidence of the behaviour of the tracker dog was crucial to sustain the conviction. In these circumstances the Court of Criminal Appeal ruled that the evidence of the constable who handled the dog on its tracking and reported the dog's reaction was properly admitted.

The court did not regard its evidence as a species of hearsay but instead the dog was described as "a tracking instrument" and the handler was regarded as reporting the movements of the instrument, in the same way that a constable in traffic case might have reported on the behaviour of his speedometer. It was argued in that case that the tracker dog's evidence could be likened to the type of evidence accepted from scientific experts describing the chemical, reactions, blood tests and the actions of bacilli. The comparison does not, however, appear to be sound because the behaviour of chemicals, blood corpuscles and bacilli contains no element of conscious volition or deliberate choice. But dogs are intelligent animals with many thought processes similar to the thought processes of human beings and wherever you have thought processes there is always the risk of error, deception and even self-deception. For these reasons we are of opinion that in the present state of scientific knowledge evidence of dog tracking, even if admissible is not ordinarily of much weight.

In the present case it is not, however, necessary for us to express any concluded opinion or lay down any general rule with regard to tracker dog evidence or its significance or its admissibility as against the appellant. We shall assume in favour of the appellant that the evidence of PW 72 and of the punches with regard to the identification of the appellant by the tracker dog is not admissible. Even on that assumption we are of opinion that the rest of the prosecution evidence namely the confession of the appellant Ex. 130 and the discovery of the spanner conclusively prove the charges of which the appellant has been convicted.[17]

4.10.10 Utility of Tracker Dogs[18]

Utility of tracker dogs in crime detection is on the increase as their use has been yielding profitable clue to crack down culprits in many a crimes. It was once thought that human liberty should not depend upon canine sensibilities due to inherent drawbacks. One of them is

17. *Razak Murtaza Dafadar v State of Maharashtra*, AIR 1970 SC 283 : (1970) 1 SCR 551 : 1970 Cr LJ 373.
18. *Bhadran v State of Kerala*, 1995 Cr LJ 676 : (1995) 1 Cr CJ 87 : ILR (1995) 1 Ker 269 (Ker).

the liability to subject the evidence to cross-examination. Another is the possibility of the dog misjudging the smell or mistaking the track. But recent trends show that hounds belonging to certain special breeds sheltered in specialised kennels and imparted with special training are capable of leading investigating agency to very useful clue in crime detection and thereby help detectives to make a breakthrough in the investigation. English courts have already started treating such evidence as admissible. In Canada and in Scotland such evidence has become, of late, admissible though in United States the position is not uniform in different States.

The Supreme Court, without reaching any final opinion on the subject, has once observed in *Abdul Razak Murtaza Dafadar v State of Maharashtra*, AIR 1970 SC 283 : 1970 Cr LJ 373 : (1970) 1 SCR 551 that dogs are intelligent animals with many thought processes similar to the thought processes of human beings though the evidence relating to tracker dog cannot be likened to the evidence of scientific experts describing chemical reactions, blood tests and the actions of bacilli. It is advantageous to refer to the decision rendered by a learned single Judge of the Bombay High Court in *Babu Magbul Shaikh v State of Maharashtra,* 1993 (3) Bom CR 309 : 1993 Mah LJ 1118 : 1993 Cr LJ 2808 (SC). Learned Judge pointed out that if the evidence passes tests of scrutiny and reliability as in the case of any other evidence, there is no warrant to treat it as inadmissible. Some guidelines have been laid down in the said decision. The following observations of the learned Judge are useful in this context as reflecting the correct position on the subject:

> *It is scientifically accepted that dogs are rated as extremely intelligent animals and that some of their sensibilities are very highly developed and are extremely reliable. It is also to be noted that there are some breeds of dogs and some strains which are specially utilised for hunting and tracking because of their abnormally high talents. If the dog belongs to one of these categories and if it is shown to the court that it has been specially trained for purposes of detection, not only would the dog-tracking evidence be admissible, but it will have to be relied upon as being evidence of a very high calibre.*

We are also of the view that evidence relating to movements of tracker dogs cannot be rejected as inadmissible and in appropriate cases it is open to the court to consider it. Its reliability, of course, depends upon the acceptability of the testimony of persons who manned the dog and those who witnessed the movements and conduct of the animal.

In this case we do not have any evidence regarding those aspects except that the police dog reached the house of the accused. We are not disposed to rely on the said item of evidence in the absence of other necessary assurance to convince us of its acceptability.

All the same, we count the conduct of the accused in scampering away from the scene when the police dog was brought to the house of occurrence. We bear in mind that people have a belief that if police dog is brought the culprit would be traced out soon. Accused would not have been in exception to the said general belief. As the accused suddenly slipped away when dog squad arrived at the scene it was specially noticed by the persons present. The said conduct is not consistent with a hypothesis of the innocence of the accused.

4.10.11 Tracker Dog Evidence Alone Insufficient[19]

Coming to the evidence of the dog pointing out the two accused along with another non-accused, it is very difficult to give any undue importance to such material. It is true that the police has for sometime now utilised trained dogs in detecting and investigating crime, but as admitted by P.W. 4 the method is not yet scientifically established. Apart from that, while this unearthly animal with proper training may be able to help the police in unearthing a crime,

19. *Medu Sekh* v *State of Assam*, 1972 Cr LJ 362 : Assam LR (1972) Ass 489.

proper care will have to be taken by the investigating agency not to overdo it to substitute the same as the sole evidence in the trial, by somehow obtaining a confession from the person on whom the dog pounces upon. Good care will have to be taken by the investigating officer to obtain and produce admissible evidence from which independently it is possible to come to the conclusion that the accused has committed the offence. In this case, we may point out that the dog jumped upon three persons and not merely two and the third man namely Asar has not even been sent up by the police.

Besides, it is not at all certain how by merely scenting the leather sheath discovered at and seized from the place of occurrence the dog jumped at accused Medu. Neither the police officer nor P.W. 4 gives the date of the parade in which the dog Juliana took part, but it appears that an *endi chaddar* in the wearing of accused Medu was seized by the police at the police station on 10th November. When a person is detected with the help of a dog by scent identification, sufficient safeguard will have to be taken by the police to ward off suspicion against manipulation. It will be good to remember that investigation has also to be fair as well as efficient. The investigating agency will have to keep in mind that the dramatic effect of the dog jumping at the accused may not always carry the day, although it will immensely help them in their investigation and the procedure is worth of encouragement, not only by resorting to it but also by improving upon it. At any rate the canine part of the material of the squad is too indefinite and insecure and cannot have the status of evidence in the case.

4.10.12 Tracker Dog work not proved Scientifically[20]

One of the main contentions advanced by the learned counsel is that the evidence pertaining to the sniffer dog is so fragile that no adverse inference could be drawn against the appellant on the strength of the said evidence. PW-8 is the police constable who deployed the police dog "Raja" for the purpose of tracking down the culprits of this murder. PW-8 said that police dog was brought to the place of occurrence on 15 April 1993 and that dog after smelling the blood, bloodstained handkerchief, a knife and a belt which were strewn on the floor near the dead body, began its pursuit in search of the hideout of the culprits or where the body was stashed away. The track, which the terrier followed thereafter, has been narrated by PW-8 in his evidence. The terminus of the track was the house of the appellant.

The uncanny smelling power of canine species has been profitably tapped by investigating agencies to track the culprits. Trained dogs can pick up scent from the scene of any object and trace out the routes through which the culprits would have gone to reach their hideouts. Developing countries have utilized such sniffer dogs in a large measure. In India also the utilization of such tracker dogs is on the increase. Though such dogs may be useful to the investigating officers, can their movements be of any help to the court in evaluating the evidence in criminal cases?

A four-fold criticism is advanced against the reception of such evidence.

1. *First* is, it is not possible to test the correctness of the canine movements through the normal method available in criminal cases, *i.e.* in cross-examination.
2. *Second* is that the life and liberty of human beings should not be made to depend on animal sensibilities.
3. *Third* is that the possibility of a dog misjudging the smell or mistaking the track cannot be ruled out, or many a time such mistakes have happened.

20. *Gade LakshmiMangaraju v State of Andhara Pradesh,* AIR 2001 SC 26677 : 2001 Cr LJ 3317 (SC).

4. *Fourth* is that even today the science has not finally pronounced about the accuracy of canine tracking.

There are basically three kinds of police dogs – the tracker dogs, the patrol dogs and sniffer dogs. Recent trends show that hounds belonging to certain special breeds sheltered in specialised kennels and imparted with special training are capable of leading investigating agency to very useful clue in crime detection and thereby help detectives to make a breakthrough in investigation. English courts have already started treating such evidence as admissible. In Canada and Scotland such evidence has become, of late, admissible though in the United States the position is not uniform in different States.

The weakness of the evidence based on tracker dogs has been dealt with in an article "Police and Security Dogs". The possibility of an error on the part of the dog or its master is the first among them. The possibility of misunderstanding between the dog and its master is close to its heels. The possibility of a misrepresentation or a wrong inference from the behaviour of the dog could not be ruled out. The last, but not the least, is the fact that from a scientific point of view, there is little knowledge and much uncertainty as to the precise faculties which enable police dogs to track and identify criminals. Police dogs engage in these actions by virtue of instincts and also by the training imparted to them.

We will now refer to two decisions of this court in which the evidence relating to sniffer dogs movement have been tested.

In *Abdul Razak Murtaza Dafadar v State of Maharashtra*, AIR 1970 SC 283 : 1970 Cr LJ 373 : (1970) 1 SCR 551 a three-Judge Bench of this court declined to express any concluded opinion or to lay down any general rule with regard to tracker dog's evidence or its admissibility against the accused, as it was not necessary to do so on the fact situation. However, their Lordships made the following observations on the usefulness or otherwise of such evidence (Para 11):

> *It was argued that the tracker dog's evidence could be likened to the type of evidence accepted from scientific experts describing chemical reactions, blood tests and the actions of bacilli. The comparison does not, however, appear to be sound because the behaviour of chemicals, blood corpuscles and bacilli contains no element of conscious volition or deliberate choice. But dogs are intelligent animals with many thought processes similar to the thought processes of human beings and wherever you have thought processes there is always the risk of error, deception and even self-deception. For these reasons we are of the opinion that in the present state of scientific knowledge evidence of dog tracking, even if admissible, is not ordinarily of much weight.*

In *Surinder Pal Jain v Delhi Administration*, 1993 Supp (3) SCC 681 : 1993 AIR SCW 1561 : AIR 1993 SC 1723: 1993 Cr LJ 1871 a two-Judge Bench expressed the opinion that "the pointing out by the dogs could as well lead to a misguided suspicion that the appellant had committed the crime, so their Lordships sidelined that item of evidence from consideration.

We are of the view that criminal courts need not bother much about the evidence based on sniffer dogs due to the inherent frailties adumbrated above, although we cannot disapprove the investigating agency employing such sniffer dogs for helping the investigation to track down criminals.

> *Investigating exercises can afford to make attempts or forays with the help of canine faculties but judicial exercise can ill afford them.*

4.10.13 Detective Dyes – Trap Evidence[21]

The next contention of the learned counsel for the appellant is that the prosecution has failed to establish the factum of the appellant having received the illegal gratification. Apart from the fact that two Courts below have, after considering the material on record produced both by the prosecution and the defence, come to the conclusion that the prosecution has established its case, we notice that it is an admitted fact by the appellant himself that PW-1 did conceal the currency notes worth Rs. 1,500 along with the case papers which he brought to the appellant, and while handling the said case papers he did come in contact with the said currency notes without knowing of its placement. This explanation has been considered and rejected by the two Courts below and we find no reason to accept the same. From the evidence of PW-1 coupled with the facts proved by way of trap, we are satisfied that the accused did receive the money as contended by the prosecution. The learned counsel for the appellant then contended that the presence of phenolphthalein powder found in the pocket of the shirt of the accused could have been due to the fact that the accused accidentally touched his shirt pocket. This is not the defence of the accused in the Courts below and the same does not also stand to reason because the phenolphthalein powder was found in the inner lining of the shirt of the accused which could not have been possible by the accused merely touching the pocket and could have been only possible if the tainted money was kept in his pocket.

The Courts below, in our opinion, have rightly rejected the defence evidence. Therefore, in our opinion, the prosecution in this case has proved the guilt of the appellant beyond all reasonable doubts.

4.10.14 Anthracene as Detective Dye[22]

This is a case in which the police resorted to the technique of anthracene powder and ultraviolet rays. According to the prosecution, anthracene powder was applied to the currency notes and was found on the hands of the appellant. This circumstance is sought to be used to prove that the appellant had received the notes.

When the prosecution wants to prove the presence of anthracene powder on the hands of the appellant, it is the duty of the prosecution to prove by means of expert evidence or books on science the nature of anthracene powder, the manner in which its presence can be detected and the tests to be applied for the purpose. The tests must be such that if after they are applied and the results are positive, the positive results lead to one and only one conclusion, namely the finding of anthracene powder. It is for the prosecution to prove that positive results are a conclusive proof of the finding of anthracene powder. This is a matter on which experts should give evidence. The prosecution can also rely on books of science.

In this case, the prosecution has not led any evidence of this type as to the nature of anthracene powder and the means of detecting presence of anthracene powder. It is true that ultraviolet lamp was used, but there is no evidence as to the result to be expected when ultraviolet rays are applied. The complainant has merely deposed that when Vithaldas gave Rs. 100 in 10 notes of Rs. 10 each to the complainant, powder was applied and the Jamadar put them in his pocket.

He does not speak of any demonstration being given at that time. According to this witness, when the police party arrived at the house of the appellant, the Saheb asked the accused about the money and then applied light to his hands and the witness saw the powder which was shiny and greenish. As regards the Jhaba, the complainant merely says that the Jamadar held the

21. *Rangaswamy v State of Karnataka,* 2003 AIR Kant HCR 236 : 2002 (4) Kant LJ 412 : 2003 Cr LJ 607.
22. *Ram Singh Badhar Singh v State of Gujarat*, 1960 Cr LJ 1207.

Jhaba in his hands and looked inside the pocket. The complainant does not say that he noticed anything on the Jhaba. The complainant's brother Karkandia has deposed that at the Society the Jamadar applied something to the notes and said that it was powder. The witness does not speak of any demonstration or experiment having been made. He was only told that powder had been applied. He deposed that the hands of the appellant were examined but did not say what the result of that examination was. He does not speak of the alleged examination of the Jhaba under ultraviolet light. According to the Panch Kanchanlal when the first *panchnama* was made, the powder was applied to the 10 notes which were put in the pocket of Kadva. He does not speak of any demonstration or experiment having been made. According to the witness, when the Saheb saw the hands of the appellant with the lamp, they had something like powder marks. When the Jhaba was examined powder like marks were also seen in the pocket. According to the Panch Jamnadas, when the police officer applied powder to the notes, he showed them to the witness in the light of ultraviolet lamp. The witness found some stains and some slight change of colour. The stains were neither bright nor faint. When the hands of the appellant were seen in the light of the ultraviolet lamp he saw stains on his hands of the type which he had seen on the notes. When he saw the Jhaba in the light of the lamp he saw stains in the pocket of the Jhaba.

It is, therefore, not clear from the evidence of these witnesses as to whether they understood the method of detection of anthracene powder. One witness speaks of marks of powder, another witness speaks of powder like marks, a third witness speaks of a change of colour and the fourth speaks of greenish shining. Head constable Jaswant Singh, who is supposed to know something more about the powder and the means of detecting it has not been examined. Nor has any expert witness deposed that when such stains or shining are noticed in the light of ultraviolet lamp, that is a sure indication of the presence of anthracene powder or that at least makes the presence of anthracene; powder highly probable. The prosecution must lead positive evidence by way of expert evidence or books of science to prove the sure method of detection of anthracene powder, the nature of the test to be applied, the result to be 'expected and whether a layman can detect anthracene powder when such test is applied. The prosecution must also prove that if the test lead to a positive result, it conclusively proves the presence of anthracene powder and nothing else. It is difficult to believe that in this case illiterate persons like the complainant and his brother and Panchas who were laymen and not at all experts on this question were able to detect anthracene powder on the hands of the appellant and on his Jhaba. Even the police inspector does not claim to be an expert in detecting anthracene powder. Head constable Jaswant Singh has not been examined. In these circumstances, it would not be correct to hold that the prosecution has succeeded in proving the presence of anthracene powder on the hands of the appellant or in the pocket of the Jhaba. In the present case, we hold that the prosecution has failed to prove beyond reasonable doubt the presence of anthracene powder.

4.10.15 Preservation of Phenolphthalein Solution[23]

It is necessary for the investigating agency to preserve the solution used for the experiment as regards detection of phenolphthalein powder on the person of the accused or on his clothes or on anything that he has touched. In case of failure or omission of the investigating agency to preserve such solution, it is open to the court to raise an inference adverse to the prosecution at the trial, depending upon the facts and circumstances of each case, and to determine upon the impact of that inference on the other evidence before it.

23. *Rameshchandra Tukaram Talekar v State of Gujarat*, AIR 1980 Guj 1 : 1980 Cr LJ (NOC) 9 : 1979 Cr LR (Guj) 301.

The need for preservation of the solution when turns pink cannot be over-emphasized. It is a corroborative piece of evidence and the prosecution by resorting to a scientific method seeks to bring into existence a piece of evidence which is corroborative in nature. In fairness, therefore, the prosecution as well as the investigating agency are required to preserve this solution. Even the investigating agency in order to be fair to the accused should see that this solution is kept in a duly sealed bottle and preserved so that whenever its production before the court is necessary, the same can be produced. It would be worthwhile to get the solution analysed chemically prior to sending the charge-sheet with a view to get the opinion of the chemical analyser whether it contained sodium bicarbonate and phenolphthalein powder or some other chemical substance.

The investigating agency cannot have the choice of destroying this solution with impunity. In fact, it may well be said that by destroying this solution, the investigating agency is destroying a relevant piece of evidence. To this extent, it can be said that the investigating agency has been unfair to the public servant who has been trapped.

It could not be contended that once the solution is required by the defence before the court and the investigating agency declares that it did not preserve it. The court must shut its eyes, close its mind to all the evidence on record and must acquit the accused irrespective of the quality of evidence on record led against him. The correct approach in such circumstances would be to lay down the proposition so well-known and so often applied to appreciation of the court, on account of non-preservation of such solution and non-production of any other evidence as to its character as found after its analysis after the trap, may raise an adverse inference against the prosecution and may as well come to the conclusion that it would be hazardous to convict the accused in the particular circumstances of the case before it.

Held, that in the instant case the solution was destroyed not on account of any dishonesty on the part of investigating agency but on account of a direction issued by the head of the department. Therefore, the observation in the case should not have an impact one way or the other on cases pending before courts.

4.10.16 Phenolphthalein as Detective Dye[24]

We now move to the critical phase. On 6 August 1965, P.W. 1 goes to the office of the accused to get clearance of 2 finished bundles of cables. The demand for money is repeated but by this time P.W. 1 acquires skill in courtship and bargains for a smaller sum of Rs 50. Whereupon the accused signs the challan for the deposit of the excise duty on these finished products (*vide* Ex. P-4). The bribe, according to the understanding, is fixed to be paid next day in the afternoon. At this stage, P.W. 1 changes his mind and discloses his bosom to the S.P.E. officers the next morning at Kotah House (Ex. P-5). The Deputy Superintendent of Police, P.W. 7 swings into action with professional proficiency. Two officials, P.W. 3 and P.W. 4, from two different offices, are fixed up to witness the search, the programme of trapping is finalised and dramatised, the signal and other details worked out, the 5 currency notes making up Rs 50 smeared with phenolphthalein powder and the visible chemical reaction when even small particles thereof are dipped in sodium carbonate solution demonstrated. The 'raiding party' troops out after these preliminary operations are put down in Ex. P-6.

Now the scene shifts to the factory. The accused arrives, Coca Cola is served, the treacherous notes are passed and put into his gullible pockets by the unsuspecting accused, and then the

24. *Som Parkash v State of Delhi*, AIR 1974 SC 989 : (1974) 4 SCC 84 (SC) : 1974 Cr LJ 784.

sequence of rap on the door, the police presence, the surrender by the startled appellant of the tell-tale currency, his handkerchief and inner lining of the trousers pocket betray him when dipped in alkaline solution and the game is up. Such is the prosecution version substantially testified to by the witness. The inexorable course of the law takes the accused to the special judge who convicts him, the High Court affirms the guilt but reduces the sentence to one year's imprisonment.

We are certainly inclined not to swallow the evidence of PW 7 and 8 without scrutiny but after having heard the appellant at length, we are prepared to agree with the High Court that the evidence of P.Ws. 7 and 8 are substantially correct. Even here, we must underscore the importance of the findings of the trap experiment, since they go a long way to underwrite the veracity of the prosecution story.

* * * * *

Yet, the contentions have been ingeniously and hopefully presented. The basic attack has been on the morally murky mechanism of criminal trap. Who has not—our legends say even *rishis* have—succumbed to attractive temptation in loneliness laid? And courts have frowned upon evidence procured by such experiments since the participants are prone to be over-anxious and underscrupulous and the victims are caught morally unawares. Even so, there are traps and traps. Where you intercept the natural course of the corrupt stream by setting an invisible contraption, its ethics is above board. On the contrary, to test the moral fibre of an officer whose reputation is suspect, if you lay a crime 'mine' which explodes when he, in a weak moment, walks on it the whole scheme is tainted. Of course, our social milieu is so vitiated by a superstitious belief that any official can be activised by illegal gratification, so confidential is the technique of give and take in which the white collar offender is adapt and so tough is the forensic problem of proof beyond reasonable doubt by good testimony in this area that the only hope of tracking down the tricky officer is by laying traps and creating statutory presumptions. Even Kautilya has stated that—

> *just as fish moving underwater cannot possibly be found out either as drinking or not drinking water so government servants cannot be found out while taking money.*

Ex-cathedra condemnation of all traps and associate witnesses is neither pragmatic nor just, nor is it fair to denounce all public servants indiscriminately. Judicial attitudes have to be discriminating, as has happened in this case. The High Court has, after careful study, chosen to accept the *bona fides* of the trap and its author Bishnoi' a senior police official of the S.P.E. (P.W.D.). We cannot accede to the theory that the trapping of a corrupt official in the usual course, is a polluted procedure.

The appellant was a survey amin in the settlement department in circle amer, district Jaipur at the relevant time. One Kushlaram p.w. 1 asked him to survey his land and demarcate it into separate holdings for himself and his six brothers. The appellant demanded rs 100 as bribe for doing the job. The bargain was settled at rs 50, which also Kushlaram was not prepared to pay. He approached the anti-corruption department upon which a trap was laid on 28 december 1970 in nawlakha bagh, amer where the land of Kushlaram was situated. He produced five currency notes each of rs 10 before the deputy superintendent of police Ram Singh to which phenolphthalein powder was applied. When the accused went to the field of Kushlaram and began his survey, he demanded the amount, Kushlaram then, paid him five currency notes which the accused placed inside the pocket of his coat. From the field Kushlarann and the witnesses Moolchand, Motilal and Ramnarain went to the hotel of Ganesh and took tea. When the accused started from there on bicycle, a pre-arranged signal was given by Kushlaram

and the police party headed by the deputy superintendent of police came and stopped the accused. He was asked to produce the money pocketed by him, but the accused denied to have accepted any money. Search was taken and from his pocket, the aforesaid currency notes were recovered. The hands of the accused were washed and the pink colour of the water showed that his hands had been soiled with the phenolphthalein powder. The pocket of the coat was also washed and the water thereof also turned into pink colour.[25]

The plea of the accused was that when he was surveying the field, he was accompanied by Kanhaiyalal d.w. 1 and Kalicharan d.w. 2 Kushlaram wanted him to show six holdings of the field and offered him money which he did not accept and returned the amount and it was how his hands were soiled with the powder, Kushlaram went away. Meanwhile the appellant gave his coat to Kalicharan. Kalicharan went to take tea with the coat. Kushlaram met him there. Kalicharan returned the coat to the accused who put on the same as usual and it was then that the police party arrived and the money was recovered from the pocket of his coat. The substance of the plea therefore, is that the money was planted in his pocket without his knowledge.

"One photograph of a scene reveals more than its description in a thousand words"

25. *Madan Lal v State of Rajasthan*, 1976 Cr LJ 1485 : 1976 WLN 40 : 1976 Raj LW 181.

CHAPTER 5

FINGERPRINTS

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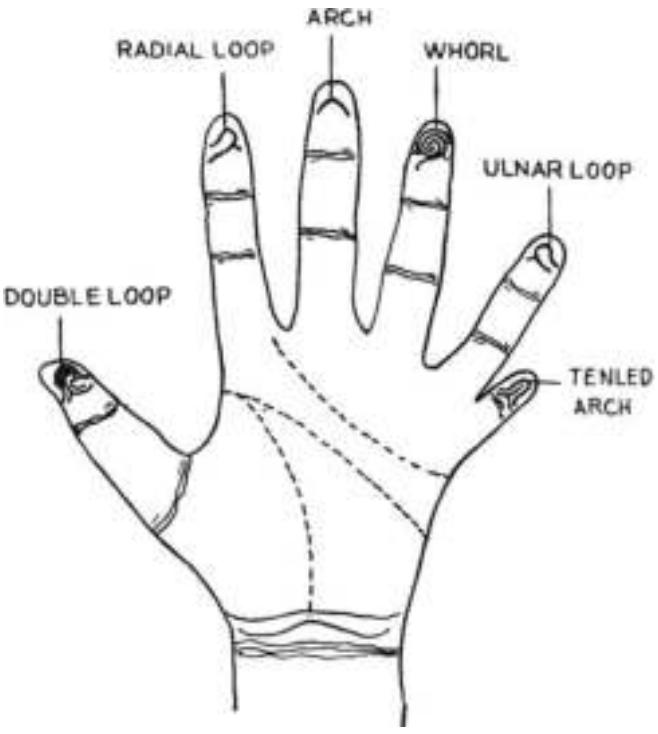

Fig. 5.1

Fingerprints are God's own seals, given to us that we may recognise his greatest creation—MAN

5.1 IMPORTANCE

The identification of criminals through fingerprints was the first important break-through in the scientific investigation of crime. As usual, the judiciary and the public took some time to believe in the utility of fingerprints as a scientific aid. It is now recognised throughout the world.

The first case in which conviction was based on fingerprint identification was a unique attempt at hoodwinking the public at large in 1882. An Argentinean widow, with two living children, wanted to remarry. She found a husband but he would marry her only if she did not bring the children along. She found no way to get rid of the children except by murdering them. She murdered them and raised hue and cry that somebody else had murdered her children. Her fingerprint in blood on the door nailed her lies. She was convicted for murder. (CH)

The fingerprints as evidence are important because of the following features of the fingerprints:

- They are unique.
- They are permanent.
- They are universal.
- They are inimitable.
- They are classifiable.
- They are frequently available in crime situations, as evidence.

5.1.1 Unique

The fingers have papillary ridges. The ridges form complex patterns. The ridge pattern of each finger has the individuality of its own. The patterns vary not only from one individual to another, but they are different in the same individual on each finger. Duplication of the pattern has never been observed. Nor the same is expected. It was customary, formerly, to calculate the probability of a finger pattern occurring in a second individual. It is no longer done as the individuality of the pattern is accepted. The probability is considered only when the print carries limited details due to smudging or when it is an incomplete mark.

In a case, the character of a woman was attacked that she had been convicted earlier. Her alleged previous employer and the police official who was investigating the case identified her. On her vehement denial, the magistrate ordered that her fingerprints be checked. The check revealed that she was not a convicted woman.

The name and the features of the woman were so alike that the two witnesses who had seen her for days together made mistake about her identity. (CH)

5.1.2 Permanent

The fingerprints of an individual do not change throughout his life. In fact, the ridges appear before birth. They start appearing during the third or fourth month of pregnancy. They remain even after the death of the individual, until the epidermal skin is destroyed by fire, putrefaction or is eaten by insects or other creatures.

In a murder case, the body of the victim was partially burnt and buried. The same was discovered many days after the burial. The body was completely disfigured and could not be identified.

The investigation officer collected skin remnants from the tips of the fingers through a doctor. He sent them to fingerprint bureau along with the one authentic print of the suspected deceased available on his Will. The bureau confirmed the identity of the deceased. (CH)

It has not been possible to change the epidermal skin through surgery. Even if it becomes possible, it can be detected through scars or residual skin. It is also not possible to destroy the ridges by rubbing, cutting, or burning. These processes temporarily affect them, but when the wounds heal, the original pattern appears again. If the injury (or burn) is too deep, a scar replaces the ridges, but a new ridge pattern does not appear. In short, the destruction of epidermis and under layers alone destroys the pattern. Destruction may take place through disease, amputation, burning, or surgery.

The permanence of fingerprints permits the identification of an individual even after many years, in fact, as long as his fingers are not destroyed and his fingerprint record is available. Many criminals have been identified through this medium after years of absconding. It is nature's identity card given to each individual.

5.1.3 Universal

All individuals and hence, all criminals carry this medium of identification. The finger and toe digits and palmar surfaces of the hands and the feet carry the friction ridges. The fingers have more intricate patterns than other papillary surfaces. They allow easier individualisation and classification. A criminal uses his hands in the commission of the crime. He leaves marks at the scene of occurrence or on objects, which his hands touch. There are, therefore, fair chances of occurrence of fingerprints in all types of crimes. If a criminal wears gloves, no fingerprints are found at the scene. However, the population in India, especially the criminal community, does not wear gloves. They, therefore, leave fingerprints in most of the cases.

5.1.4 Inimitable

Successful forgeries of fingerprints have not been reported so far. Near perfect forgeries have been attempted. It is possible that the advancement of science may bring the forgery still closer to perfection, but a complete success in the enterprise is extremely difficult, if not impossible. The investigating officer, the expert, the court, and the lawyers, however, must guard against such possibilities, especially in view of the potentialities of the computer. They should make use of scientific tools, which will undoubtedly enable the expert to detect such frauds.

For all practical purposes, it is taken that it is not possible to forge a fingerprint. This is important because, then, no person can deny his or her fingerprints. The identification through properly recorded fingerprints, when made on adequate data, is certain and infallible.

5.1.5 Classifiable

The scope for the classification of fingerprints is large, and yet the work is simple. Records of millions of persons can be classified and kept and retrieved easily. Computerisation of fingerprint records, and hence their searches are becoming popular because the computers have increased the efficiency beyond imagination. Computerised records and computers have made the time and labour efficient exceedingly.

5.2 NATURE

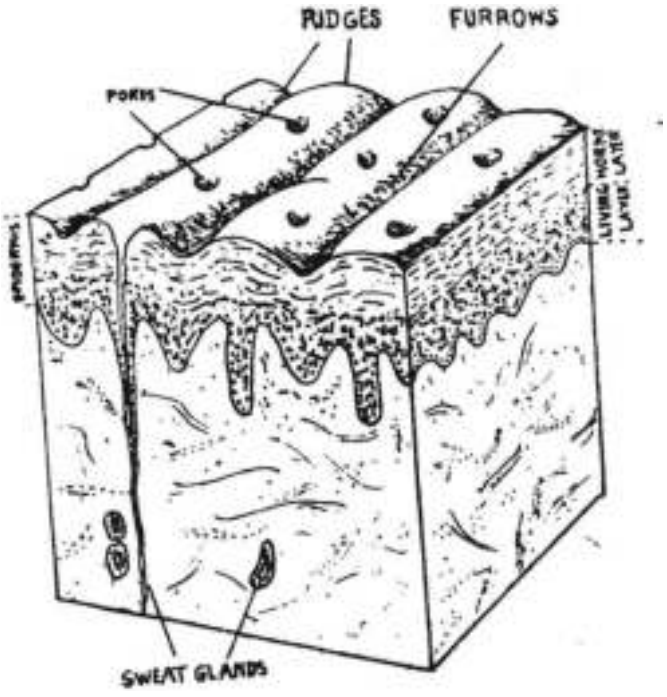

Fig. 5.2

Schematic view of palmar surface, illustrating the ridges, furrows, pores and the epidermal skin structure

Palmar surfaces of the hands and the soles of the feet have friction ridges. The ridges are the raised portions of skin between furrows on either side. They are also known as *papillary* or epidermal ridges. The ridges flow in various directions giving rise to innumerable patterns.

Fingerprints are the marks of these epidermal ridges. The term fingerprints include marks of these ridges from any part of the body (foot!) they have come.

The ridges have small pores, which exude perspiration, which is secretion of the eccrine gland in the ridges' skin. It spreads all over the hand surface. The evaporation of the perspiration concentrates its non-volatile constituents, notably, the common salt, oils, fats and the albumins. Some materials also come from the foreheads as human often touch or rub their foreheads and hairs.

Whenever the epidermis comes in contact with a surface, the above materials are left thereon in small quantities. The deposits take the pattern of the ridges. The marks left thereon are called latent prints. They are two-dimensional prints when the surface registering the mark is rigid. They can be developed to give visible prints. The rough and fibrous surfaces do not give decipherable patterns.

Visible prints are created when smeared hands or fingers with coloured powders or liquids come in contact with a smooth surface. They are called patent prints.

The fingerprint marks may be distinct impressions (three-dimensional marks) if the receiving surface is pliable such as butter, dust, putty, wet paint, mud, wet clay, kneaded flour, any semi-solid substance or warm wax (paraffin or sealing wax). They are called plastic prints.

Two-dimensional marks are technically prints, and three-dimensional marks are impressions. But both the terms are used interchangeably in the study of finger marks.

Fig. 5.3

Important Ridge Patterns (L to R)

Top row: l. Ordinary Arch 2. Tented Arch 3. Radial Loop (Middle row) 4. Ulnar Loop 5. Whorl 6. Whorl Bottom row 7. Central Pocket Loop 8. Accidental 9. Twinned Loop

5.3 CLASSIFICATION

There are numerous ridges in a fingerprint. Their lengths, shapes, turnings, joining, bifurcations vary so extensively that the combinations of these variations are virtually infinite. Each finger of an individual has a pattern of its own. The patterns have been divided, for the purpose of classification, into categories based upon their general shapes. There are three major systems of classifications:

1. Henry System. It was developed in India and is used in most parts of the world.
2. Roschler System. It was developed in Germany and it is used there.
3. Vucetich System. It is used in South America.

Henry system is used in India. It classifies the fingerprints in the following classes:

5.3.1 Arches

The ridges are found in an **arch-like formation** in this pattern. When the height of the arch is small, the pattern is **plain arch**. If it is considerable, it is a **tented arch**. The pattern has no turned or twisted ridges nor does it have a delta, generally. The frequency of occurrence of arch patterns in the human population is about 5%.

5.3.2 Loops

In the loop pattern, one or more ridges form a loop by curving backwards. Consequently, there is a **delta** and a **core** in the pattern. Delta and core are known as fixed points of a pattern. They do not appear in some incomplete prints.

Loops are subdivided into **ulnar** and **radial** loops. The division is based on the flow of the ridges. If the ridges flow towards the ulna, the pattern is ulnar. If the ridges flow towards radius, the pattern is radial. The prints on paper, from right hand will be:

- **Ulnar;** here the ridge flow is from left to right (print 4, in Fig 6.4).
- **Radial;** here the ridge flow is from right to left (print 3, in Fig 6.4).

The direction of flow would be in the reverse order for ulnar and radial patterns in prints from left-hand fingers.

Loop patterns are the most frequent patterns in humans (in about 65%) of the population.

5.3.3 Whorls

Whorls are the simplest to identify. They have at least one ridge forming a complete circle or oval. Whorls have one or more cores and two deltas in complete patterns. They are found in about 35% of the human population.

5.3.4 Composites

The composites are combinations of any of the above-mentioned three patterns. Thus, the central pocket loop is a combination of a loop and a whorl, a double loop pattern has two loops. They form either a lateral pocket loop or a twinned Loop.

5.3.5 Accidentals

A pattern, which does not fall in the above classes, is considered accidental. Such a pattern usually has two or more of the above patterns and two or more deltas.

5.4 INDIVIDUAL FEATURES

The above classification of fingerprints divides the patterns into groups. It does not lead to individualisation of a print. The latter is possible through observation of the minute details, also known as ridge characteristics or minutiae. The following types of ridge characteristics (with their shapes, sizes and positions) make each pattern unique/individual.

1. ***Angle:*** It is the angle formed by two intersecting ridges.
2. ***Bifurcation:*** It is the splitting of a ridge into two ridges.
3. ***Break:*** It is a short gap in a ridge.
4. ***Core:*** It is the central point of a fingerprint. It helps to identify a fingerprint, as there are tremendous variations of the cores. It is also known as a fixed point of the pattern. The arch patterns have no chores.
5. ***Delta:*** It is the outer terminus of a pattern, formed by either bifurcation of a ridge, or by the widening of the two ridges, which were running almost parallel up to the point of the delta. The complete whorl and loop patterns have usually two and one deltas respectively.
6. ***Divergence:*** It is going apart of two ridges.
7. ***Dot:*** It is small dot-like raised epidermal skin.
8. ***Enclosure or Lake:*** It is an enclosed area along a ridge by another short curved ridge, connected to the longer ridge at both the ends.
9. ***Fragmentary ridges:*** It is a disjointed ridge — a sequence of rods (short ridges).
10. ***Focal Fixed point:*** *Delta* and core are the focal (fixed) points of a pattern.
11. ***Fork:*** It is the short ridge, which bifurcates from a ridge to form a tongue-like structure. It is also called **Tongue.**
12. ***Incipient ridge:*** It is malformed ridge, incomplete and thin, in between the normal ridges. The ridge may or may not appear in a pattern.
13. ***Pattern area:*** It is the area contained between two type lines.
14. ***Ridge Count:*** Ridge count is the number of ridges between:
    - Delta and delta
    - Delta and core point
    - Delta and any characteristic point
    - Any two characteristic points

    It is an easy checkpoint for possible match/non-match.
15. ***Ridge Tracing:*** It is ridge coursing in whorls, from lower left delta ridge to the right delta. If the tracing ridge meets the right delta:
    - Within two ridges, (less than two ridges above or below the delta), the pattern is 'M' (Meeting) type.
    - Above the delta by more than two ridges, it is 'I' (Inner) type.
    - Below the delta by more than two ridges, it is **'0'** (Outer) type.
16. ***Rod or short ridge:*** It is a short independent ridge.
17. ***Spur:*** It is a short appendage to a ridge.
18. ***Staple:*** It is the structure formed by two rods, joint at the top by a short ridge, at the centre of the pattern.

19. ***Termination:*** It is the free end of a ridge.
20. ***Tongue:*** It is the second name of the characteristic called fork (supra).
21. ***Trifurcation:*** It is a point where three ridges meet or from where a ridge trifurcates

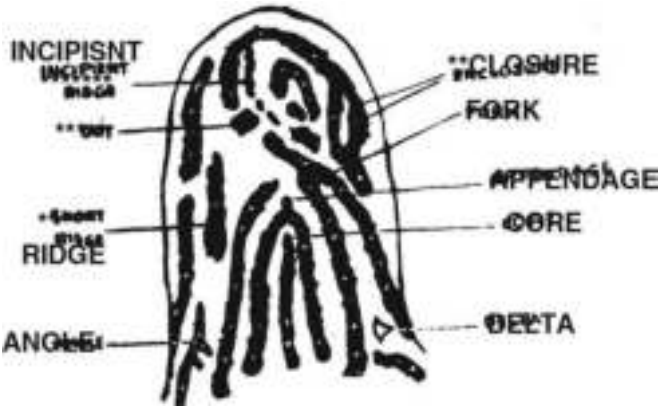

Fig. 5.4

Schematic illustration of some ridge characteristics used in fingerprint identification

5.5 LOCATION

A criminal touches many objects in the commission of a crime. They are likely to bear fingerprints. The investigating officer, while locating the fingerprints, in addition to the usual procedures, should:

1. Reconstruct the scene of occurrence mentally. Imagine himself in the role of the culprit and check the possible articles/sites, which he could have touched in the commission of the crime.

2. Leave no fingerprints of his fingers on the articles. Some persons recommend the use of gloves, to handle articles, to search fingerprints. They are not used usually. They hinder the manoeuvrability of the hands. Besides, they lead to complacency. The fingerprints on the articles handled may get mutilated. The articles are handled, therefore, from edges or from rough surfaces where it is not possible to develop the fingerprints.

3. Preserve other evidence. A fibre, a hair, a paint flake, a streak of blood, or semen stain may be covered by powders or chemicals and get lost if care is not taken while developing latent fingerprints.

4. Avoid inhaling powders and chemicals as all the powders and the chemicals are injurious to health, grey powder, iodine and osmium tetraoxide are especially so.

5. Photograph all visible and developed prints along with proper identification data chit and a scale.

5.5.1 Routes

The telltale prints may be found on the doors and windows, knobs and handles, glass panes, locks, touched by the culprit enroute. The windowsills, polished or dusty, also take up the prints and record the visit of the culprit to the place.

A police store (where case property was kept) was burgled. Fingerprints in the dust, were found deposited on some articles. The possible suspects were checked and the correct one identified. (CH)

Finger and palm prints, in blood, were found on a door and on an almirah in a murder case. The prints were compared with those of the suspects. They were correctly identified. The culprits were convicted in spite of the fact that there were no eyewitnesses. (CH)

5.5.2 Vehicles

The transport vehicles (cars, cycles, jeeps, etc.) are likely to bear prints of their occupants and drivers. The portions of the vehicles likely to come in contact with the hands are the outside surface: the door handles, the steering wheel, and the mirror.

In a famous dacoity case, the dacoits, after looting and killing escaped in a bus. They abandoned the bus later. Fingerprints were found and collected in large number from the vehicle. The fingerprint record was checked. It was possible to identify three of them. The rest of the work was simple. The whole gang was apprehended in a few days.

The fingerprint evidence later brought them convictions. (CH)

5.5.3 Scene of Occurrence

The richest source of fingerprints is the scene of occurrence. The culprit must touch or handle objects at the scene. The evidence should invariably be available if it is properly searched at the appropriate time, at the appropriate places. Boxes, furniture and leather, Rexene or plastic goods, such as purses, portfolios and bags should be carefully examined. Fingerprints are sometimes found on broken windowpanes, thrown away bottles, tumblers, furniture, and crockery.

Fingerprints in the blood are sometimes observed on furniture, walls, floor, windowpanes, cupboards and almirahs. They fix the actual scenes of crime, in cases where the culprit has tried to create a fake crime scene.

5.5.4 Bathrooms

The culprit may have visited the bathroom or a water closet. The places should be carefully searched.

> *A murder took place in a running train. The compartment was totally sealed and thoroughly searched for evidence. Fingerprints on washbasin tap handle and some other articles were discovered. After screening a large number of suspects the correct perpetrators were identified and convicted on fingerprint evidence. (CH)*

5.5.5 Utensils

If the culprits have taken food and drinks, the likely articles to carry fingerprints are refrigerators, tumblers, plates, saucers, bottles, cups, spoons and utensils. They, therefore, should be examined.

> *In a government loan case, the document bore a fingerprint impression. The fingerprint, along with the ten fingerprints of the suspect, was sent to the fingerprint bureau. The print on the document did not tally with the specimen fingerprints. However, from the size and pattern of the print the expert suspected it to be a toe print. On comparing the toe print of the suspect with the questioned print, the suspicion was confirmed and the culprit identified. (CH)*

5.5.6 Leftover Objects

The culprit sometimes leaves objects like shoes, papers, tools, weapons of offence, torch or lantern at the scene of occurrence accidentally or otherwise. He may desert his conveyance on his way to or from the scene. These objects have excellent chances of bearing fingerprints.

A few years ago, fingerprints of the culprit were discovered on the inside of the back of a watch left at the scene of occurrence. (CH)

In a poisoning case, the bottle containing the poison (found near the deceased) was checked for fingerprints. It was possible to identify the correct culprit, from the partial prints available on the bottle, from a number of suspects. (CH)

In an arson case, the fingerprints were discovered on a bottle of kerosene oil found at the scene of occurrence. They were compared with the fingerprints of several suspects. The correct arsonist was identified. (CH)

In another interesting case, the culprit was searching the pockets of the victim with blood smeared hands. He happened to touch a piece of paper in the pocket of the victim. He left a faint print in blood on the paper. The piece of paper got conviction to the culprit. (CH)

5.5.7 Documents

Fingerprints should be found on anonymous and pseudonymous letters containing abusive or indecent language, threats or complaints. Ordinarily, it is not possible to locate these prints. This is due to the carelessness of the addressees or the investigating officers. Such documents should be handled only when absolutely essential.

5.5.8 Dead Bodies

In infanticides, the fingerprints are discovered on the body of the infant. The greasy mass, with which the body of the infant is covered at the time of birth, retains the prints. Relatively recent experiments and researches have indicated that it is possible to develop fingerprints on dead human skin. This will help in identifying the culprits in offences against persons. It will be particularly helpful in cases of rape with murder or murders by manual strangulation. It was not possible to develop fingerprints on the skin previously but now the following technique gives success in some cases:

1. Fuming with cyanoacrylate ester, with or without pre-treatment
2. Lead dusting followed by X-ray radiograph
3. Magnetic powders
4. Iodine fuming

The developed prints are photographed. Lifting by usual means may follow. The places of interest to locate the fingerprints are the neck, breasts, thighs, wrists, and ankles.

5.5.9 Search

A search for fingerprints should be systematic. The area suspected to bear fingerprints should be thoroughly checked. The surfaces are examined with oblique lighting (light is thrown at an angle). It is desirable to avoid diffused light. A semi-dark place is preferable.

Most of the prints (visible, plastic, and latent) are located in this way. Other appropriate developing agents discover prints on semi-glazed or unglazed paper, documents, currency notes, raw wood, cloth, leather and coloured surfaces.

A magnifying lens is not only helpful in locating the prints, but it is also useful to judge the quality of the fingerprints.

The use of Polylight (brand name) system is quite convenient for searching fingerprints. Polylight gives radiation, in strong beams, from UV to IR range. They reveal the fingerprints in many a case.

The polylight system is portable. It can be used at the scene or elsewhere. The lighting system is available under numerous other brand names.

5.5.10 Development Techniques

The commonly used techniques to develop latent fingerprints are:

5.5.10.1 Powder Development

Powders are an excellent medium to develop latent prints on small surfaces, in competent hands. They fail only in case of old prints and prints on rough surfaces.

The powders of all shades and varieties have been used. However, the following powders meet most of the situations in fingerprint development:—

- The grey powder is used for all dark coloured surfaces.
- The black powder is used against a light background.
- The fluorescent (anthracene) powder is used for multi-coloured surfaces. Fingerprints developed by anthracene are exposed to ultraviolet rays and photographed. The prints developed with fluorescent powders need reversals, that is, the prints are prepared from the transparencies.
- Metallic powder (aluminium, copper, brass, gold, antimony) and universal powder are also used in special situations. The metallic or universal powders are useful for fingerprints on sticky surfaces.
- The use of magnetic powders with Magna Brush facilitates developing fingerprints on large areas.

The powder used should be amorphous, dry and of uniform consistency of flour. It should be stable, somewhat sticky and chemically non-reactive (inert). Fingerprint powders are available commercially. They are purchased from reliable dealers.

The powdering techniques are simple, yet they need experience. In the hands of a novice, they may mutilate the prints. Only experienced and qualified operators, therefore, should handle the prints in crime situations.

Powdering is done with a camel hair brush, usually. Atomisers and automatic fingerprints powder spray devices are being used increasingly. The new devices save time and reduce the human factor in the work.

The automatic sprayer is a boon where extensive searches are required. Likewise, Magna Brush with magnetic powders is useful where large areas are involved. The method is quick and almost automatic.

5.5.10.2 Chemical Methods

The perspiration materials (sodium chloride, amino acids, and oils) deposited by the fingers, are utilised to develop the latent prints by chemicals methods.

- Sodium chloride when treated with silver nitrate solution gives silver chloride, which is insoluble. It ultimately gives black colour on exposure to light.
- Amino acids react with ninhydrin to give pink colour.
- Oils and fats in the deposited residue reduce osmium tetra oxide to osmium, which is black in colour.

The oils and fats from the perspiration adsorb iodine preferentially and develop the latent fingerprints.

5.5.10.3 Wet Methods for Latent Prints

The following wet methods are in current use:

1. The **Wet Powder** method has been tested and used at many crime scenes by the Kyoto Prefectural Police. The fingerprint powder suspension, employed in this method, is prepared in this way:

   The fingerprint powder is a mixture of aluminium powder 20%; pollen of lycopod 70%; and hignum powder 10%. The latter is aluminium powder containing 1% of an antiseptic agent. It is suspended in liquid mixture of dimethyl ether 15%, dimethyl acetone 80%, and ethyl alcohol 5%.

   Just before using, put 10 grams of the fingerprint powder in 100 millilitres of the liquid. Mix it well and place it in a spray bottle and gently spray on objects from a distance of 40 centimetres.

   When spraying a large area, shake the container periodically to keep the powders in proper suspension.

   Allow sprayed objects to dry at room temperature and then brush the surface with a camel hair brush to obtain the best results. Lift the developed print with gelatin paper (like the opaque rubber lifters used in the USA).

   The mixture remains effective for only about two hours after preparation. Discard any remaining mixture in the bottle after use.

2. The **Diazoflourine Method** is a comparatively recent development. The method is far more effective on paper for latent prints than the ninhydrin method. It reacts with the amino acids in perspiration to give fluorescent prints.

   Dissolve the chemical in an organic solvent mixture, containing 4% methanol and 2% acetic acid. Dip the exhibit bearing the latent in the solution for 5 seconds. Take it out, dry it (1/2 a minute) and observe the print(s). If the print(s) is not developed, repeat the dipping/drying processes till the print(s) appears.

5.5.10.4 Fuming Techniques

A number of fuming techniques are known. The following ones are in current use:—

- ***Iodine Fuming***

  Iodine fuming develops fingerprints on most of the surfaces, but the process is more tedious, troublesome and in certain cases less satisfactory. It is used only where powder methods are not successful for prints on paper, starched clothes, raw wood and leather.

There is no chemical reaction between the print material and the iodine. It gets adsorbed on the outline of ridges preferentially due to the presence of oils to give brownish tinge. As it is volatile at ordinary temperature, it gets evaporated in due course, leaving the surface in the original condition, theoretically, only; some staining always remains. The surface can subsequently be treated with powders or chemical for development. This advantage makes iodine fuming an ideal tool to locate latent prints. It is consequently often used as such in spite of certain disadvantages.

The technique requires a fuming tube filled with iodine and calcium chloride separated and held in position with glass wool. Simple blowing through the tube evaporates iodine, which gets deposited on the surface exposed to the fumes.

Fuming is also carried out in a fuming cupboard or fuming chamber. Iodine is heated in a dish, and the exhibit is exposed to the fumes.

Iodine fuming locates sometimes even old latent prints on paper.

- ***Cyanoacrylate Fuming***

  Cyanoacrylate ester in an effective chemical to develop prints on skin, fabrics, plastics, and surfaces where powders cannot be used due to stickiness of the surface or for some other reasons.

  The exhibit bearing the latent print, if it is small, is kept in a closed container containing cyanoacrylate. If the interiors of cars or rooms are to be searched for latent fingerprints, an appropriate amount of the chemical is kept in the closed place and left closed for about 12 hours.

  The cyanoacrylate fluid is kept in a closed pouch, which is opened and kept in the closed container with the exhibit, or in the car or room. The fumes react with the perspiration materials and produce chalky white prints, which can be photographed or lifted on an adhesive tape. The cyanoacrylate fuming has been used successfully to develop and identify a rapist from his fingerprints on pillion cover. A drug peddler was identified from his fingerprints on a plastic pouch.

- ***Metallic Vapour Fuming***

  The usual methods to develop latent fingerprints do not work well on plastics and polythene surfaces sometimes. Metallic vapour fuming, as an additional technique, has been developed for the purpose. However, it is successful only when the prints on polythene (even of low density) are fresh.

  The metals used are gold, zinc, and metal alloys. They are evaporated in a heated chamber, in a vacuum. The vapours get deposited on the exhibit. They reveal the prints.

5.5.10.5 Laser Development

The use of laser in the location, development and collection of latent fingerprints has given dramatic results. The fingerprints fluoresce under the lasers. The laser rays have been used to locate and develop fingerprint on the following surfaces:

5.5.10.5.1 Paper

Fingerprints on paper, as old as 40 years, have been developed with the lasers.

> *In a dramatic case, a Nazi war criminal was identified through fingerprints developed by lasers. The fingerprints were 40 years old. The Nazi after committing war crimes, and responsible for numerous killings of Jews, had entered America and there had joined the clergy. At the time of detection he was already a Bishop of Roman Catholic Church, of course with a false and changed identity, now a naturalised citizen of USA.*
>
> *The USA detected concealment of the real identity. The proceedings of extradition went on for nine years when his false identity was proved through a latent fingerprint found on a document in the German archives. The document, which helped to his real identity was a postcard dated 14-6-1941, addressed to Himmler, one of the closest associates of Hitler. The Nazi denied authorship of the document, which was highly incriminating. The left thumb impression, not only established his authorship but also the real identity of the war criminal. (CH)*

5.5.10.5.2 Metals

5.5.10.5.3 Plastics

5.5.10.5.4 Glass

5.5.10.5.5 Skin of the living/dead persons

The main advantages of the laser detection/development techniques are:

1. It can develop/reveal old prints.
2. It needs no pre-treatment of the print/surface.
3. They do not stain/soil/damage/affect the print bearing surface in any way.
4. They can be used even after some conventional methods for the development has been tried. In fact, some methods enhance the chances of success with lasers. For example, prior use of fluorescent powders, ninhydrin, and cyanoacrylate give better fluorescent images with laser, even with faint marks.

   The main disadvantage of the use of the laser was that the equipment was rather heavy. It was not convenient to carry it to the crime scenes. Comparatively recent developments and research have reduced the weight. It is being used at the crime scene by some police forces, abroad.

The background surface affects the luminescence generated in the fingerprint. In fact, the surface has a predominant effect on the success or failure of the method.

The Laser technique is simple. It involves:

1. The suspected surface/print is exposed to lasers.
2. The prints, made visible, are observed. Safety goggles are used to cut off the harmful laser rays to the eyes.
3. The revealed print(s) is photographed using a filter to cut off the laser rays.

An area bearing about three sequential prints can be examined under the lasers in one go.

The following types of lasers have been used:—

1. Argon Ion laser.
2. Copper Vapour laser.
3. Neodymium Yttrium Aluminum Garnet laser.

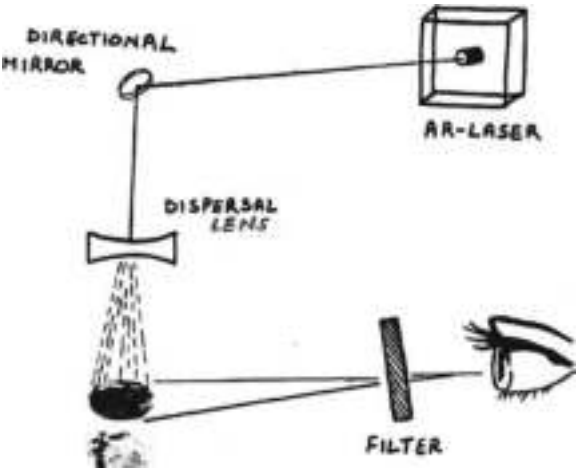

Fig. 5.5

The schematic laser arrangement for latent print detection

5.6 COLLECTION

In India, fingerprint experts collect fingerprint evidence. It is done by the fingerprint proficient, posted in each district to collect fingerprints of the convicts. Alternatively, he is part of the crime scene team. He is trained to collect the latent and other fingerprints from the crime scene.

The collection of fingerprints varies according to the nature of the evidence, the surface, and the place at which they are available.

5.6.1 Articles

One should collect the evidence on a portable article by collecting the article itself. Mutilation of the prints or breakage of the particles is prevented by proper and careful packing. Ready-made board with-holes, nuts and bolts are provided in the investigation kits for the purpose. They can also be improvised. Rubber, leather, and cork washers are used frequently to keep the article in position. Proper packing ensures that:

1. The print-bearing surface does not come in contact with the container or other surfaces of the object or objects.
2. The object does not collide or rattle with the packing material, with other parts of the same object or with the contents of the object.
3. The contents do not seep, spill, or fall out of the container bearing prints. They are either properly corked or preferably the contents are taken out.
4. The packet is sealed in such a way that the contents cannot be taken out of the packet without breaking the seal. The seals should be legible and it should not be possible to remove the same, by peeling off the sealing wax.

5.6.2 Photography

Prints are photographed in all cases, wherever possible. Photographs record the prints permanently. In case of damage to the original article, they prove useful evidence.

The latent prints are made more conspicuous by oblique lighting and shading the surface from diffused light. Three photographs, one showing the questioned object in its surroundings, the second, showing the print on the object and the third, close-up photograph, containing the details of the prints are taken. While taking photographs of the fingerprints one should:

1. Prepare negative of the same size or of a smaller size than the print on the object.
2. Manage to keep the fingerprints darker than the background. This is achieved by providing a background of lighter shade in case the print is found on colourless transparent objects. In other cases, powder of a darker shade than the background is chosen.
3. Photograph those latent prints at the scene of the crime, which cannot be photographed in the daylight, at night.
4. Use a digital camera for photography and check each snap immediately after clicking. Delete those, which are not clear. Retake the shot.
5. Use colour filters to increase the contrast. A set of about ten main shades meets most of the situations. Choose the filter after a visual trial.
6. Keep a scale and an identification chit along with the print, while taking photographs.

A 'fingerprint camera' that takes up 1:1 photograph was being used by some police forces in olden days. It is no longer used.

5.6.3 Lifts

Fingerprints in the dust or those developed with powders are generally lifted. The process of lifting is simple: a tacky tape is pressed against the print. The dust or powder is picked up by its surface, forming the original pattern thereon. A second or even a third lifting is sometimes possible. But as the quality and clarity of subsequent lifts go on deteriorating, one should ensure a proper lift in the first attempt.

Lifting appears to be the most convenient technique to collect fingerprints. It does not require any photographic or other equipment. However, fingerprint experts do not encourage lifting. The process is recommended only where the collection of the original article or the photography of the print is not possible. The reasons advanced are:

1. The lift does not give the nature of the background. Defendants frequently allege that the lifts have been obtained from the utensils or vessels used by the accused in jail and falsely shown that they were recovered from the scene.
2. The lift may not pick up all the details available due to defects in the lifter or in the lifting process. For example, air bubbles or excessive pressure in the lifting damages the ridge details.
3. Light pressure on the other hand may give incomplete details.
4. The lifts deteriorate with the passage of time. The print may, thus, lose the details.

The arguments against lifting are substantial, but not prohibitive. However, the use of lifters is not frequent because photography cannot be dispensed with. There are a few situations where lifting proves superior to photography:

1. A fingerprint on the curved surface is not adequately covered by photography. Lifting gives better evidence on a flattened surface, though a periphery camera can photograph prints on the curved surfaces.
2. Multi-coloured background surfaces interfere with the photography of the prints. It does notaffect lifting.

3. Photography of prints on polished surfaces is difficult due to reflection. The reflexion has no effect on lifting.
4. If a print is found on a fractured surface (say of glass), fractures interfere with the photography. Lifting is not affected so much.

Lifting is an important and convenient technique in the collection and preservation of fingerprints. While lifting fingerprints one should:

1. Use a lifter of good quality only. There are rubber lifters, transparent tapes, Acetabs and Folien paper. Seek guidance from the fingerprint bureau for the latest and best materials.
2. Lift only properly developed prints. Excessive powder on the prints and incompletely developed prints do not give good lifts.
3. Lift prints developed with powder, which does not contain chalk. Chalk reacts with the tacky material and spoils the print in due course. Use black powders, whenever possible.
4. Allow only an experienced person to lift the evidence prints.
5. Photograph the print to show the location of the print, with and without lift preferably with an identification chit.
6. Do not introduce your own fingerprints on the lifter.

5.6.3.1 Techniques

For proper lifting, one should:

- Take a piece of the lifter of a suitable size.
- Peel off the protective film/sheet.
- Stick one edge of the piece near one end the print.
- Press the piece over the print bearing surface gradually and uniformly starting from the struck end with the bulb of an index finger.
- Lift the piece by peeling off, starting slowly from one comer.
- Cover the lift with a protective transparent thin film of fold the tape to sandwich the lifted print.

5.6.4 Plastic Print

Casting is used to preserve/collect plastic prints sometimes. The common casting material is a cellulose acetate solution. The casting techniques are substantially similar to those used for footprints and tool marks.

5.6.5 Fingerprints from Dead Bodies

The fingerprints of all unidentified dead bodies are taken because their fingerprints may lead to their identification. The problems of collection of prints from dead bodies vary under different situations:

- If the death has taken place just a short time ago, the prints are taken in the way they are obtained from the living persons.
- If the body is in *rigor mortis* (*i.e.*, the body is stiff) the muscles are loosened by vigorous exercise. If the same proves ineffective, the tendons are cut and fingerprints are taken in the usual way.

- If the body was mummified, the digital skin gets shrunk, it is brought to normal condition by immersing it in 3% solution of caustic potash (Potassium hydroxide), till it regains the original form. It is then washed with water and fingerprints are taken. The digital skin can be preserved in formalin.
- In some cases the friction ridges wear off from the surface of the hand, in buried corpses. They remain on the inner side of the skin. The digital skin is removed and photographed.

5.6.6 Fingerprints in Dust

Fingerprints and footprints (naked, or even footwear marks) are found in dust, deposited on the smooth surface. Theoretically, they are plastic prints but the dust layer is so thin that it needs different treatment for lifting. An electrostatic method has been developed.

The method involves a rubber plastic sheet or film, which is kept over the print. An aluminium foil covers the upper surface. High voltage is applied to the Aluminium sheet. The high voltage picks up the dust particles, and they get attached to the rubber sheet creating the pattern existing in the dust on the original surface. The lifted prints should be photographed and the lift preserved as such.

The main advantage of lifting over photography is that the background surface does not interfere and the appropriate shade of the aluminium sheet can increase the contrast between the lifted prints and the background surface of the sheet.

Large areas of the suspect surface can be covered on one sheet and a number of impressions can be lifted in one go. They can be studied conveniently at the fingerprint bureau.

5.6.7 Laser Fluorescent Print collection

The latent prints are made fluorescent with appropriate lasers and developers. They are photographed in the normal way.

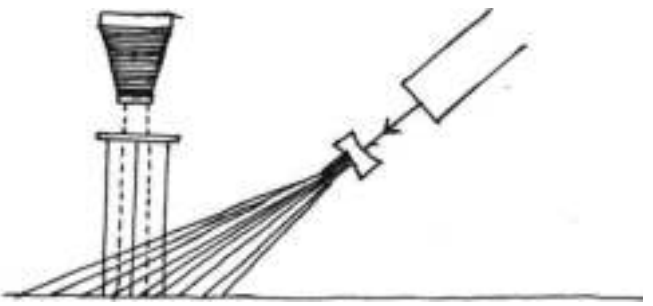

Fig. 5.6

Lasers make latent fingerprints fluorescent. They are photographed

5.6.8 Specimen Prints

Exemplar prints can be collected using Live Scan or by using ink on paper cards.

Fig. 5.7
A sensor imaging print

Fig. 5.8
Friction ridges on human finger

Specimen prints are taken on specially prepared cards for record purpose. The NCRB has designed a fingerprint card. The bureaus in the country are using the same. Fingerprint recording work is simple. It can be mastered by any person in a short while. Police have trained proficient' s for the purpose.

5.6.8.1 Technique

Fingerprint ink, a slab, 10 x 20 cm (made of glass or metal), a roller, 10 cm long and about 3 cm in diameter (made of rubber) and fingerprint cards are the only requirements. Glazed, semi-glazed or even ordinary paper can replace the cards.

An even thin layer of ink is spread over the plate (slab), by rolling ink over the slab with the roller. Each finger is rolled once on the inked surface from one side end of the nail to the other end and then on the card or paper in the allotted space on the card. For plain impressions of all the fingers, the bulbs of the fingers are pressed moderately first on the slab and then similarly on the paper.

Recently a rubber slab and a metal (brass) roller have been suggested. The inking is done by the roller. It is claimed to distribute the ink more uniformly.

5.6.8.2 Precautions

While collecting and sending specimen fingerprints one should:

1. Send only clear and complete fingerprints for examination. The fingerprints are obtained only if the fingers and the apparatus are clean, and inking is proper. The cleaning is done usually with spirit, petrol, or kerosene oil.
2. Let the subject relax his fingers and hands. The operator does the printing.
3. Give a note relating to missing, cut, additional or injured fingers at the appropriate place. If there is an additional finger, its print is obtained.
4. When a chance print is discovered at the scene of occurrence, send specimen prints of the household, the investigating staff and of the other persons who could leave the print there along with the prints of the suspects on fingerprint forms. Plain paper, if forms are not available, may be used.

A scanner to scan finger to get specimen prints has also come up. It is not yet being used in India to any extent.

Collection of fingerprints is the most crucial part in the comparison and evaluation of fingerprints, especially in automatic computer comparison mode. Proper image of the print facilitates the evaluation. A poor image may mislead the experts.

Two types of image acquisition apparatuses have come up. They measure and compare the spaces between the ridges (and furrows) and their shapes.

One type of instrument uses optical readers, and the second type uses solid-state readers. They determine the physical differences between the ridges and the furrows through sensors from the mark bearing surface of the finger.

The finger surface is elastic. Varying pressure and direction give non-uniform images of the same finger. The mode of collecting the specimens from fingers is, therefore, crucial. An apparatus that records the print without physical contact with the finger has been proposed, and the work is going on.

5.7 SINGLE DIGIT SYSTEM

A criminal seldom leaves a complete set of fingerprints at the scene of the crime. Instead, one may find prints from one, two or three fingers of a criminal. It is well-nigh impossible to establish the identity of the criminal from these prints by a search of the ten fingerprint record files. In rare cases, the search may prove fruitful, but then it takes weeks.

There was, therefore, a definite need for a classification system which could permit the identification of a chance print. Several fingerprint experts attempted such a classification. Battley developed a system for single fingerprints. It is known as the Single Digit System.

In Single Digit System, single fingerprints fingers are numbered 1 to 10 and their prints are collected in ten separate collections. The first five are from the right hand, in the order: thumb (1), index finger (2), middle finger (3), ring finger (4) and little finger (5). The collections six to ten relate to left-hand fingers in the same order.

Each of these ten collections is sub-divided on the basis of patterns. Thus ten sub-divisions are obtained: plain arches, tented arches, radial loops, ulnar loops, whorls, twinned loops, lateral pocket loops, composites, accidentals, and scarred prints.

These sub-divisions are further sub-classified, on the basis of core and delta formations, ridge counting and ridge tracing. Battley devised a special magnifying glass with concentric circles. The device is useful in sub-classification and evaluation of the fingerprints.

The single digit fingerprint files of all the convicted criminals are maintained. On the conviction of a person, two extra fingerprint slips are prepared and sent to the single digit fingerprint record officer who maintains the collections after classification.

If a chance print is discovered at the scene of occurrence, the article bearing the print is sent to the officer-in-charge of the single digit fingerprint records. In case, the chance print is found on the non-portable article, a fingerprint expert is called to the scene of occurrence. He photographs or lifts the print.

The chance print is then checked with the record. Sometimes it is possible to know the identity of criminal soon after the occurrence and the criminal is arrested before he disposes off the incriminating evidence.

Automation in recording and comparing fingerprints has made the single digit system redundant.

5.8 COMPUTERS IN FINGERPRINTS

Management of fingerprint records was an uphill task. The searches of the fingerprint corresponding to the given print were doubly so and sheer drudgery. Both the tasks were labour/time/cost-intensive. The computer has changed the situation completely. The fingerprints are now digitised. The digitised data of millions of fingerprints are filed systematically and stored automatically for easy retrieval. The computer itself creates the data relating to the new fingerprint, to be searched and compared, and compares the same with the stored data. It comes up with the possible source(s) of the new print if it exists in the stored record, in a short time!

The entry of a new fingerprint and deletion of an old unwanted file is equally easy. Computer scanning and digitisation of the fingerprint patterns involve:

1. Segmentation.
2. Feature extraction.
3. Comparison of fingerprints' digitised data *inter se.*
4. Image enhancement.
6. Ridge restoration.

The computers are now carrying out all these functions. The time taken for the searches has been reduced drastically. The expert verifies the final computer match or possible matches of the given suspects or victims.

The computer system, in India, is under the control of the National Crime Record Bureau **(NCRB)**, Ministry of Home Affairs, Government of India, has been termed as Fingerprints Analysis Criminal Tracing System (FACTS). The names of systems vary in different countries. But basic process is the same. The FACTS system of India provides a search system for both types of fingerprint records:

1. Ten digit system.
2. The single-digit system.

In the ten-digit system, an expert scrutinises the fingerprint on the fingerprint slip. Fingerprints of adequate quality are fed into the computer. The computer scans the prints and records two scans:

1. Preview scan.
2. Detailed scan.

The data obtained by the scanner is then matched with the already stored data and the computer gives a shortlist of the possible match(es) that are verified by a fingerprint expert.

In some cases, the computer may indicate 'No Match' or 'Data insufficient or improper'. In the latter case, the print can be resubmitted by modifying the search parameters, if there has been some error in defining the parameters earlier.

The computer system utilises the minutiae, the ridge characteristics known as ridge ending or ridge bifurcation. The characteristics identified through:

1. Co-ordinates.
2. Noting the flow of the ridge.
3. Inter-spaces between the ridges.

For the identification of a print, about eighty ridge characteristics (minutiae) are chosen from each of the print in the central digital data collection. A match is, however, made when about twenty-four minutiae correspond. A search takes about fifteen minutes.

Usually the Fingerprint Record is digitised with the following parameters:

1. Probable digit number.
2. Print orientation (if understood).
3. Definite (or probable) pattern class (if deciphered).
4. Core/Delta position.
5. Search Area (top, bottom, right half, left half, central, etc.), if known.

When a new print is to be matched, the data from the print is collected in the above-mentioned parameters and fed into the computer. On command, the computer compares the data already in store relating to the minutiae segment-wise, along with the above parameters. The shortlisted prints, in order of decreasing probability, appear on the screen along with the new print. A hard copy of the prints is obtained, and a fingerprint operator studies the prints to make the final identification. The comparison and the verification can be done on the screen itself.

The identification of a chance or other print is based on correspondence found in the minutiae; the computer produces the shortlisted matching fingerprints in descending order of probability. An expert checks the shortlisted images. The fingerprints matching data is also linked with the data available with the police forces — the photograph of the person along with his *modus operandi* and criminal record is verified. They facilitate the investigating work of the investigation.

The matching speed of the computer is very high. It depends, of course, upon the total data to be scanned. It can make about 500 matches per second in single-digit system if the data record relates to about one-fourth of a million prints. The match is often possible with about twenty-four clear characteristics. Continued research is making extensive improvement in the instrument. Keeping in view the utility, the instrument is not expensive. The instrument can allow identification of even partial prints. New filing and deletion of the unwanted record are still easier. The speed and surety reduce the burden on the experts who can devote their time and energy usefully elsewhere. The labour saved and the speed of the computer evaluation of the fingerprints has made the process indispensable.

5.9 EVALUATION

The problem of evaluation is not difficult at all when complete and clear questioned, and specimen fingerprints are available. However, in many cases clear and complete prints are not

available. The pattern of the print, core and delta formations, ridge counting, ridge tracing, and other characteristics are studied. If there is identity in all respects, the prints are said to have originated from the same source. If some dissimilarity exists, they should be explicable. For example, there can be differences due to cuts, scars, injuries and intentional tampering of the patterns. Or, they may be caused by the presence of foreign matter on the surfaces (on which the prints were left), on the fingers or in the material (fingerprint ink) with which the prints were obtained.

The problem of identification is difficult in incomplete, smudged or imperfect prints. The experts of various bureaus in the world are not unanimous as to what constitutes 'sufficient evidence'. Some experts believe that there should be at least twelve points of similarities before the common source of the prints can be identified, while others have based identifications sometimes on six points only. It is, in fact, difficult to lay any hard and fast rule on the subject. Some peculiar or rare ridge characteristics may give sufficient evidence with six points only in some cases while in others the usual or common type of six ridge characteristics may be considered insufficient to permit the identification of the common source.

When the experts find fewer points of similarities (without of course any discordances) they should consider probability figures based upon the incidence of occurrence of these ridge characteristics.

An expert sometimes finds it difficult to evaluate whether a given print is a forged print or a real one, especially when he has inadequate equipment at the site. A strong source of the spotlight, polylight, a stereomicroscope and a micrometre eyepiece prove useful in the identification of forgery in most of the cases.

Fingerprint experts evaluate evidence ordinarily with the help of a magnifying glass or by photographic enlargements. However, instruments like dactyl scope and Projectina can be used with advantage. They expedite and facilitate the work of the experts. Battley's magnifying glass with a reading disc is also helpful in the evaluation of fingerprints.

Instrumental aids have come to the rescue of the fingerprints expert, to reduce his drudgery; in addition to comparison microscopes, the digital camera and computer have changed the whole scenario.

The crime and specimen prints images can be studied side by side in magnified form and can also be superimposed over each other. The contrast and colour can be changed. Therefore, if the specimen print has been taken in the corresponding configuration to that the crime print, the evaluation can be carried out easily and quickly. The computers, in addition, are being used for automatic evaluations.

The computer has brought real revolution in fingerprint evaluations.

Filing and searching of fingerprints cards of the criminals are based upon the classification system used by a bureau. The discussion on it is of interest to the experts who are working the system only. It is, therefore, not discussed here.

Evaluation of erased, altered, obliterated, and superimposed fingerprints is sometimes required. These aspects of fingerprints are better handled by a forensic science laboratory and should, therefore, be referred to those quarters.

One high court has directed the investigating officers that the physical evidence collected from the scene of occurrence should be sent to the relevant experts immediately. The recovered evidence, therefore, should be dispatched direct from the scene of the occurrence to the laboratories whenever possible. Otherwise, the reasons for the delay should be given.

5.10 PRESENTATION

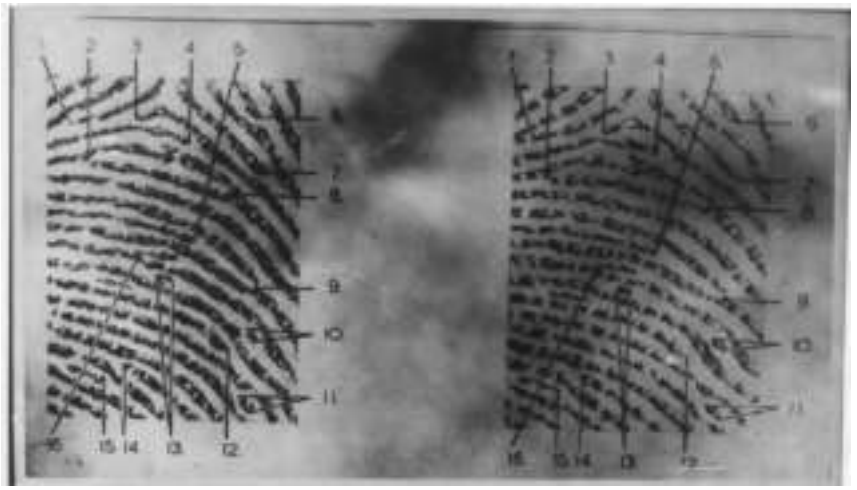

Fig. 5.9

An ideal comparison chart establishing identity of the common source of the specimen print and the print collected from the scene

The ideal presentation of fingerprint evidence is to produce the evidence illustrated with photographic charts of questioned and specimen prints pasted side by side, prominent points of similarities indicated thereon by drawing lines and giving corresponding numbers and explanatory notes given in the margin. This is desirable in view of the fact that the courts feel that they are to 'form their own opinion' from the data presented. However, this is not always possible in all cases due to heavy load of work with the bureaus; or additional expense.

Photographs are indispensable for proper presentation if the *ipse dixit* of the experts is not to be accepted. A probable opinion needs more elaboration and photographic illustrations, photographs and extensive notes. Only then, the relative value of a particular ridge characteristic can be appreciated for appropriate weightage by the court. Whenever possible, the probability value for each point based upon actual experience and research are given.

When evaluating the expert evidence it is seldom worthwhile to doubt the identification of fingerprints given by an honest and experienced expert. However, it is worthwhile to see:

1. Whether the expert is a *bona fide* expert or an imposter; his reputation for honesty reveals the same.
2. Whether the accused, who has been identified through fingerprint, had legal (or otherwise) access to the article on which the fingerprints were discovered. If so, can he show to have left the prints in circumstances other than the commission of a crime?
3. Whether the correct legal procedure has been followed in the collection of the fingerprints.
4. Whether independent witnesses have signed the recovery memorandum.
5. Whether the investigating officer and the witnesses identify the article, bearing the prints, allegedly recovered from the scene.

6. Whether the chain of custody of the objects carrying the evidence is intact; or, is there some period during locating, collecting, packing, sealing, storing and dispatching for which the custody of the article is not known?
7. Whether the specimen prints have been taken in the presence of competent authority and properly witnessed and identified.
8. Whether the marks identified are clear or not.
9. Whether the identification is based on generally accepted standards or not.

Unfortunately, there is a tendency among private experts to give evidence even on insufficient data in favour of their clients. The courts have to check that the expert has not done so.

5.11 LEGAL ASPECTS

5.11.1 Specimens and the Constitution

It was previously contended that if an accused is forced to give his fingerprints, it is equivalent to compel him to be a witness against himself. This is against Article 20(3) of the Indian Constitution, which provides that "*no person, accused of any offence, shall be compelled, to be a witness against himself*".

Cases were rejected by the high courts' on the plea that taking of fingerprints against the will of the accused amounted to compel him to be a witness against himself. Ultimately, the Supreme Court considered this matter in one case.[1] A Bench of seventeen-judges has decided that taking of fingerprints even against the wishes of the accused person is not against the Constitution. The controversy is thus settled.

5.11.2 Authorities

The Identification of Prisoners' Act specifies, in its section 4, the authorities who can take fingerprints:

1. Section 4 of the Act permits a police officer of the rank of sub-inspector or an investigating officer (in offences covered by Chapter XIV of the Code of Criminal Procedure, 1973) above this rank to fingerprint an accused, arrested for an offence punishable with at least one year's rigorous imprisonment.
2. **Under sections 4 and 6** of the Act, a first class magistrate can direct any person to be fingerprinted, if in the opinion of the magistrate, it will expedite the investigation of the case. **All means to collect the specimen can be used.**
3. **Section 73** of the Evidence Act also covers fingerprinting. The court may direct any person present in the court to give his fingerprints, if the same is required for comparison with questioned fingerprint by the court.
4. Section 311 of the Cr CP, 1973.

5.11.3 Fingerprint Experts

The evidence of a fingerprint expert, a person especially skilled in fingerprints, is considered relevant evidence by virtue of section 45 of the Indian Evidence Act.

1. *The State Of Bombay v Kathi Kalu,* 1961 AIR 1808 : 1962 SCR (3) 10.

5.11.4 Fingerprints Reports

In view of the general recognition of the individuality of fingerprints, the Code of Criminal Procedure has been modified. The report of the director of a fingerprint bureau is accepted as evidence, without his attendance, like the report of a chemical examiner, under section 293 of Code of Criminal Procedure, 1973. The court may call the expert for evidence, if it so decides.

5.12 MISCELLANEOUS

5.12.1 Palm and Sole Prints

The surface of the hand, fingers, toes and the soles of the feet bear friction ridges, like fingers. They are not as complex. There is generally no classified record. Individual prints are compared/identified in each case.

The best method of taking specimen palm prints is to make use of a wooden block having a curved upper surface. Half of the curve is covered with an aluminium or copper plate, which is inked in the same way as in taking fingerprints. The second half of the curved surface is covered with a piece of white paper on which palm prints are to be recorded. The hand is pressed lightly against the inked plate and then against the paper. The fingers are spread out somewhat and pressure is applied against the knuckles and the wrist. This is accomplished if the operator presses his hand across the hand which is being printed. Air pillows are also used for the purpose.

Sole prints of children, born in a hospital, are used, sometimes, for their identification. They do not carry much ridge details. Usually, dimensions, crease marks, and phalange marks are utilised for identification purposes.

5.12.2 Poroscopy

It is the study of pores, present on the friction ridges of the palmar surface of the human body, for personal identification.

Pores are minute openings on the friction ridges through which sweat comes out. The diameter of the pores varies from 88 to 220 microns and the number from 9 to 18 per cm. They have characteristic shapes and sizes.

The study of pores has not been utilised to any extent in criminal investigations in India (or elsewhere), mainly because it is difficult to develop pore patterns in chance prints found at the scene of occurrence. Likewise, it is difficult to get a proper specimen print. Print inks of complex formulae have been suggested. Some experts have found ordinary fingerprint ink quite useful for the purpose.

The pore patterns should prove invaluable in incomplete fingerprints and palm or sole prints. Their infinite variations will allow identification of the print. Twenty to forty pores would provide sufficient evidence for identification purposes.

5.12.3 Body Prints

Nose prints and prints from other body parts can be utilised for identification purposes. For example, Iris and retinal patterns are being utilised for identification purposes. The simplicity of the fingerprint system, however, makes it convenient to use them for personal identification purposes.

5.12.4 Fingerprints of Twins

The fingerprints from identical twins are different. The basic presumption is that all fingerprints are unique. The support for the assumption is that even when they are from the ten digits of a person they are different. Further, nobody has ever reported identical patterns, identical twins. The misconception that twins carry identical patterns is baseless.

5.12.5 Transmission

Fingerprint images (and formulae) can be transmitted anywhere in the world by internet (e-mails!). The transmissions of fingerprints have been facilitated by the digitalisation of the prints.

5.12.6 Advances in Collection of Fingerprints

Digital holography, micro-X-ray fluorescence (μXRF), and the Scanning Kelvin Probe (SKP) are relatively recent scientific and technological advancements to obtain latent fingerprints without compromising or destroying the original fingerprint evidence found at a crime scene. We have yet to induct the innovations in our system.

5.12.7 New Evaluation Technology

The FBI announced the replacement of the Integrated Automated Fingerprint Identification System (or IAFIS) technology with the Next Generation Identification (NGI) system. The NGI system uses several new biometric features. It reduces significantly the processing times from 2 hours a case, to about 10 minutes. It has improved the quality and the certainty of the matches also. The technology is indispensable and needs adoption in India.

Fig. 5.10

A sensor imaging print

5.13 CASE LAW

Supreme Court Cases

(21st Century)

5.13.1 Absence of Fingerprint Evidence not Fatal[2]

Author's Summary

It is a case of murder of a female by bludgeoning her. There were numerous eyewitnesses to the beating. However, the IO did not check the weapon for fingerprints as too many persons had handled the weapon. The trial court acquitted the culprit for want of fingerprint evidence.

The SC (and High Court) ruled that in view of the consistent eyewitness accounts, the absence of fingerprint evidence is not fatal to the case.

Highlights italicised

Relevant Extracts (Verbatim)

> 4. After going through the judgment of the trial court, we find that the High Court was justified in setting aside the same because the judgment of acquittal is based upon surmises, conjectures and assumed contradictions. The High Court rightly found that in fact, there was no contradiction in the depositions of the eyewitnesses and omissions or improvements noticed by the trial court did not amount to contradictions for the purposes of discarding the testimony of otherwise trustworthy natural witnesses. The trial court totally ignored the testimony of the eyewitnesses while holding that they had not seen the injury because, according to the F.I.R., the injury allegedly had been inflicted on the nose of the deceased. All the witnesses had deposed in the court that the injury was caused on the body of the deceased from behind near the right shoulder and the force with which it was caused resulted in the cutting of the vital inner parts of her body.

Non-examination of the fingerprint expert has not, in any way, affected the case of the prosecution because it has come on record that before the seizure of the weapon of offence many persons had handled it. Though the report of the Serologist is not available on the record, yet the report of the Chemical Analyser clearly and unequivocally shows that the clothes of the appellant and the weapon of offence were stained with human blood. Non-ascertainability of the blood group cannot be made a basis to discard the evidence of eye-witnesses.

5.13.2 Court No Fingerprint Expert[3]

Author's Summary

It is a case of fraud and forgery. A thumb mark was disputed on a sale agreement. The finding of the first appellate court, merely on a casual perusal, recorded without the benefit of any expert opinion, that **'there appeared to be no marked differences between the two thumb impressions, and therefore sale agreement must have been executed by first defendant'**, The tial judge as expert was unacceptable to SC.

Highlights italicised.

2. *Keshavlal v State of Madhya Pradesh,* AIR 2002 SC 1221 : 2002 AIR SCW 1007 : 2002 Cr LJ 1776 (SC).
3. *Thiruvengada Pillai v Navneethammal,* AIR 2008 SC 1541 : 2008 AIR SCW 1684 : (2008) 4 SCC 530.

Relevant Extracts (Verbatim)

2. In the plaint, the plaintiff (appellant) alleged that the first defendant (Adilakshmi) agreed to sell the suit schedule property to him under an agreement of sale dated 5-1-1980 for a consideration of Rs. 3,000, and received Rs. 2,000 as advance. She agreed to execute a sale deed by receiving the balance consideration of Rs. 1,000 within three months. Possession of the suit property was delivered to him, under the said agreement. He issued a notice dated 14-2-1980 calling upon the first defendant to receive the balance price and execute the sale deed. The first defendant sent a reply denying the agreement. To avoid performing the agreement of sale, the first defendant executed a nominal sale deed in regard to the suit property in favour of the second defendant (first respondent herein), who was her close relative. The said sale was neither valid nor binding on him. On the said averments, he sought specific performance of the agreement of sale, against the defendant, alleging that he was ready and willing to perform his part of the contract.

3. The defendants denied the allegation that the first defendant had executed an agreement of sale dated 5-1-1980 in favour of the plaintiff or that she had delivered possession of the suit property to him. They contended that plaintiff had concocted and forged the document with the help of his henchmen to defraud the defendants. They claimed that the first defendant had executed a valid sale deed dated 11-2-1980 in favour of the second defendant and had delivered possession of the suit property to her; and that the second defendant had put up a hut in the schedule property and was actually residing therein. The second defendant raised an additional contention that she was a *bona fide* purchaser for value and, therefore, the sale in her favour was valid.

14. Section 45 of the Indian Evidence Act, 1872 relates to 'opinion of experts'. It provides *inter alia* that when the Court has to form an opinion as to the identity of handwriting or finger impressions, the opinion upon that point of persons specially skilled in questions as to identity of handwriting or finger impressions are relevant facts. Section 73 provides that in order to ascertain whether a finger impression is that of the person by whom it purports to have been made, any finger impression admitted to having been made by that person, maybe compared with the one, which is to be proved. These provisions have been the subject-matter of several decisions of this Court.

14.1. In the *State (Delhi Administration) v Pali Ram*, 1979 Cr LJ 17 : (1979) 2 SCC 158 : AIR 1979 SC 141 Para 29, this Court held that a Court does not exceed its power under section 73 if it compares the disputed writing with the admitted writing of the party so as to reach its own conclusion. But this Court cautioned:

Although there is no legal bar to the Judge using his own eyes to compare the disputed writing with the admitted writing, even without the aid of the evidence of any handwriting expert, the Judge should, as a matter of prudence and caution, hesitate to base his finding with regard to the identity of a handwriting which forms the sheet-anchor of the prosecution case against a person accused of an offence, solely on comparison made by himself. It is therefore, not advisable that a judge should take upon himself the task of comparing the admitted writing with the disputed one to find out whether the two agree with each other; and the prudent course is to obtain the opinion and assistance of an expert.

The caution was reiterated in *O. Bharathan v K. Sudhakaran*, (1996) 2 SCC 704 : 1996 AIR SCW 685 : AIR 1996 SC 1140; Again in *Ajit Savant Majagvai v State of Karnataka,* (1997) 7 SCC 110 : 1997 AIR SCW 3315 : AIR 1997 SC 3255) referring to section 73 of the Evidence Act, this Court held:

The section does not specify by whom the comparison shall be made. However, looking to the other provisions of the Act, it is clear that such comparison may either be made by a handwriting expert under section 45 or by anyone familiar with the handwriting of the person concerned as provided by section 47 or by the Court itself.

As a matter of extreme caution and judicial sobriety, the Court should not normally take upon itself the responsibility of comparing the disputed signature with that of the admitted

signature or handwriting and in the event of the slightest doubt, leave the matter to the wisdom of experts. But this does not mean that the Court has not the power to compare the disputed signature with the admitted signature as this power is clearly available under section 73 of the Act.

14.2. In *Murari Lal v State of Madhya Pradesh*, (1980) 1 SCC 704 : AIR 1980 SC 531 : 1980 Cr LJ 396, this Court indicated the circumstances in which the Court may itself compare disputed and admitted writings, thus:

The argument that the Court should not venture to compare writing itself, as it would thereby assume to itself the role of an expert is entirely without force. Section 73 of the Evidence Act expressly enables the Court to compare disputed writings with admitted or proved writings to ascertain whether a writing is that of the person by whom it purports to have been written. If it is hazardous to do so, as sometimes said, we are afraid it is one of the hazards to which Judge and litigant must expose themselves whenever it becomes necessary. There may be cases where both sides call experts and the voices of science are heard. There may be cases where neither side calls an expert, being ill able to afford him. In all such cases, it becomes the plain duty of the Court to compare the writings and come to its own conclusions. The duty cannot be avoided by recourse to the statement that the Court is no expert. Where there are expert opinions, they will aid the Court. Where there is none, the Court will have to seek guidance from some authoritative textbook and the Court's own experience and knowledge. But discharge is must, its plain duty, with or without expert, with or without other evidence.

The decision in *Murari Lal* (supra) was followed in *Lalit Popli v Canara Bank,* (2003) 3 SCC 583 : 2003 AIR SCW 1238 : AIR 2003 SC 1796.

15. While there is no doubt that Court can compare the disputed handwriting/ signature/finger impression with the admitted handwriting/signature/finger impression, such comparison by Court without the assistance of any expert, has always been considered to be hazardous and risky. When it is said that there is no bar to a Court to compare the disputed finger impression with the admitted finger impression, it goes without saying that it can record an opinion or finding on such comparison, only after an analysis of the characteristics of the admitted finger impression and after verifying whether the same characteristics are found in the disputed finger impression. The comparison of the two thumb impressions cannot be casual or by a mere glance. Further, a finding in the judgment that there appeared to be no marked differences between the admitted thumb impression and disputed thumb impression, without anything more, cannot be accepted as a valid finding that the disputed signature is of the person who has put the admitted thumb impression. Where the Court finds that the disputed finger impression and admitted thumb impression are clear where the Court is in a position to identify the characteristics of fingerprints, the Court may record a finding on the comparison, even in the absence of an expert's opinion. But where the disputed thumb impression is smudgy, vague or very light, the Court should not hazard a guess by a casual perusal.

The decision in Murari Lal (supra) and Lalit Popli (supra), should not be construed as laying a proposition that the court is bound to compare the disputed and admitted finger impressions and record a finding thereon, irrespective of the condition of the disputed finger impression. When there is a positive denial by the person who is said to have affixed his finger impression and where the finger impression in the disputed document is vague or smudgy or not clear, making it difficult for comparison, the Court should hesitate to venture a decision based on its own comparison of the disputed and admitted finger impressions. Further, even in cases where the Court is constrained to take up such comparison, it should make a thorough study, if necessary with the assistance of counsel, to ascertain the characteristics, similarities and dissimilarities. Necessarily, the judgment should contain the reasons for any conclusion based on comparison of the thumb impression, if it chooses to record a finding thereon. The

Court should avoid reaching conclusions based on a mere casual or routine glance, or perusal.

16. In this case the first defendant had denied having put her finger impression on Ex. A-1. She died during the pendency of the suit before her turn came for giving evidence. The High Court having examined the document has clearly recorded the finding that the thumb mark in Ex. A-1 was pale (that is light) and not clear. The document though dated 1980, was executed on two stamp papers which were purchased in 1973 and 1978. Contrary to the recital in the agreement that possession had been delivered to the plaintiff, the possession was not in fact delivered to plaintiff, but continued with the first defendant and she delivered the possession to the second defendant. The title deeds were not delivered to the plaintiff. The attesting witnesses were close relatives of plaintiff and one of them was not examined. The scribe's evidence was unsatisfactory. It was also difficult to believe that the first defendant, an illiterate old woman from a village, would enter into an agreement of sale on 5-1-1980 with plaintiff, and even when he is ready to complete the sale, sell the property to someone else hardly a month thereafter, on 11-2-1980. In this background, the finding by the first appellate Court, recorded without the benefit of any expert opinion, merely on a casual perusal, that there appeared to be no marked differences between the two thumb impressions, and therefore Ex. A-1 (sale agreement) must have been executed by first defendant, was unsound.

5.13.3 Fingerprint identifies the barbaric Murderer[4]

Author's Summary

It is a case of brutal rape, murder and robbery of a young widow. The courts accepted the identification of the culprit through fingerprints found on the almirah (at the crime scene) from which the valuables were robbed. The fingerprints played the crucial role to place the culprit at the scene and identify him.

The SC maintained the death sentence for the brutal murder, dubbing it as '**the rarest of the rare cases**'.

Highlights italicised

Relevant Extracts (Verbatim)

According to the prosecution, Jayashri, mother of Suresh (PW-2) and sister of Manjula (PW-22), was married to one Dr. Maradi Subbaiah who died about two years prior to 28-2-1998 on which date the incident which resulted in S.C. No. 725 of 1999 is alleged to have occurred. After the death of her husband, Jayashri and her son Suresh, were staying in premises No. 14/8 situated at Dasarahalli, Bhuvaneshwarinagar, Bangalore, as a tenant of one Lalitha Jaya (PW-8). Suresh was studying in Upper K.G. in Blossom English School. His mother would drop him to school at Bagalkunte at 8.30 a.m. and would bring him back at 1.00 p.m. after classes were over.

* * *

On 28-2-1998, Jayashri took Suresh to school as usual at 8.30 a.m. and brought him back at 1.00 p.m. and they had lunch together in the house. After lunch, Suresh went out to play with his friends and apart from Jayashri there was no one else in the house. Suresh returned to the house at about 5.00 p.m. and saw the accused, B.A. Umesh, in the hall of the house who introduced himself as "Uncle Venkatesh" and told Suresh that his mother, Jayashri, was

4. *BA Umesh v Registrar-General, High Court of Karnataka*, Criminal Appeal Nos. 285–286 of 2011, decided on 1 February 2011.

possessed by the devil and that he had, therefore, tied her hands and was going to bring a Doctor. The accused then left the house with a bag filled with articles.

According to the prosecution, Basvaraju (PW-10) and Natesh (PW-11) saw the accused going out of Jayashri's house with the bag on 28-2-1998 at about 4.30 p.m Suresh then went into the room and saw his mother lying flat on the ground with blood on the floor and her hands tied together with a sari at one end and the other end of the sari was tied to a window. As she did not respond to his voice, Suresh went to Kusuma Shetty (C.W. 7), a neighbour, and told her what he had seen. Kusuma Shetty called Geetha Hegde (C.W. 6) and Lalitha Jaya (PW-8) and together they went near Jayashri's house with Suresh and through the window they saw Jayashri lying on the ground. Lalitha Jaya then called Bylappa (PW-7), a Police Constable, living in the same locality who telephoned Papanna (PW-9), the Inspecting Officer, who came to the place of occurrence with Police Constable Garudappa (PW-6). In the meantime, on being informed, A. Kumar (PW-14) a Police Constable working in the Dogs Squad, Jagannath (PW-16), a Police Photographer and R. Narayanappa (PW-13) a Police Inspector and fingerprint expert arrived at the place of occurrence. B.N. Nyamaagowda (PW-29), the Investigating Officer, found that Jayashri was lying dead on the floor with her genitals exposed and blood oozing from her vagina. The doors of an almirah in the house were open and articles in the house were lying scattered. He prepared a report and sent the same through PW-6 to the Police Station to register a crime. PW-6 took the said report to Peenya Police Station and the same was registered as Crime No. 108 of 1998. He then prepared a First Information Report and sent the same to Court. A copy of the F.I.R. was also sent to PW-29, the Investigating Officer. PW-14 had come from the Dogs Squad with Dhrona, a sniffer dog, who having sniffed the dead body and Jayashri's clothes went towards the pipeline and returned. PW-16, the Police Photographer, took photographs of the dead body and the scene of the offence, PW-13, the finger-print expert, found fingerprints on a wall clock and also on the handle of the almirah (Exts. P. 14 and P. 15). PW-29, thereafter, conducted inquest over the dead body in the presence of Panch witnesses, P.Ws. 2, 3 and 4, and sent the dead body for post-mortem examination to Dr. Somashekar (PW-26) who after conducting the post-mortem on Jayashri's dead body opined that death had occurred due to smothering after the commission of sexual assault.

* * *

Ms. Suri submitted that the other prosecution witnesses were those who had been associated with the investigation in one way or the other, such as PW-13, Narayanappa, the fingerprint expert who found the fingerprint of the appellant on the handle of the almirah in the victim's room, PW-26, the doctor who conducted the post-mortem examination on the body of the victim, PW-27, D. Siddaramaiah, Forensic Expert and PW-29, the Investigating Officer in the case.

* * *

Ms. Suri then addressed the third aspect of the prosecution case relating to the lifting of the fingerprint of the appellant from the handle of the almirah in the room of the deceased. It was contended that the procedure adopted for obtaining the fingerprint of the appellant by PW-25, while he was in custody, for the purpose of comparison with the fingerprint, lifted from the handle of the almirah in the room of the deceased, left sufficient room for doubt about the authenticity of the fingerprint taken from the appellant for the purpose of comparison. It was submitted that rather curiously all the other fingerprints in the room, including the one taken from the wall clock, were smudged and were of no use for the purpose of comparison, which also gave rise to doubts as to whether the fingerprints alleged to have been taken from the handle of the almirah in the room of the deceased, had actually been lifted from the said place. Ms. Suri submitted that the fingerprint of the appellant taken by PW-25 when the appellant was in custody, should have been taken before a Magistrate to ensure its authenticity. Furthermore, although, the said fingerprint was taken on 8-3-1998, the same was sent to the F.S.L only on 15-3-1998.

Furthermore, the specimen fingerprints of the accused had not been taken before or under the order of the Magistrate and, accordingly, the conviction based on the evidence of the fingerprints of the accused on the brass jug were held to be not sustainable. Ms. Suri also referred to the decision in *Musheer Khan's* case (supra), where the question of the evidentiary value of a fingerprint expert was considered apart from the question of identification and it was held that such evidence fell within the ambit of section 45 of the Evidence Act, 1872. In other words, the evidence of a fingerprint expert is not substantive evidence and can only be used to corroborate some items of substantive evidence which are otherwise on record and could not, therefore, have been one of the main grounds for convicting the appellant of the offences with which he had been charged.

* * *

31. The fourth question which had been indicated by Ms. Shenoy regarding the identification of the fingerprints taken from the handle of the steel almirah kept in the room of the deceased, here the charged offences had been committed, clearly establishes the presence of the appellant in the said room. Ms. Shenoy submitted that there was no acceptable explanation from the side of the defence to explain the fingerprints of the appellant on the handle of the almirah, which was in the room of the deceased. Ms. Shenoy urged that once the presence of the appellant was established in the room when and where the offences were perpetrated, the chain of circumstantial evidence was to a large extent almost complete and was completed with the recovery of the articles stolen from the room of the deceased, in the room rented to the appellant by Jayamma (PW-17).

* * *

49. The aforesaid position is further strengthened by the Forensic Report and that of the Fingerprint Expert to establish that the fingerprints which had been lifted by PW-13 from the handle of the steel almirah in the room, matched the fingerprint of the appellant which clearly established his presence inside the house of the deceased. The explanation attempted to be given for the presence of the fingerprints on the handle of the almirah situated inside the room of the deceased does not inspire any confidence whatsoever. In a way, it is the said evidence which scientifically establishes beyond doubt that the appellant was present in the room in which the deceased was found after her death and had been identified as such not only by PW-2, who actually saw him in the house immediately after Jayashri was murdered, but also by P.Ws 10 and 11, who saw him coming out of the house at the relevant point of time with the bag in his hand. The fingerprint of the appellant found on the handle of the almirah in the room of the deceased proves his presence in the house of the deceased and that he and no other caused Jayashri's death after having violent sexual intercourse with her against her Will.

50. Apart from causing the death of the victim, the evidence also points to the commission of rape of the deceased by the appellant. That the deceased was lying naked with blood oozing out of her genitals and both her hands tied by a sari at one end clearly indicate violent sexual intercourse with the deceased. The presence of semen-like material in her vagina, which was found during the post-mortem examination, was collected and sent for micro biological examination and showed the presence of sperms. The presence of spermatozoa in the vaginal smear which was sent for micro-biological examination and the presence of blood stains at the vaginal outlet together with laceration of the vagina from the vaginal outlet on the posterior wall establishes and confirms the charge of violent sexual intercourse, *viz.*, rape.

On the question of the sentence we are satisfied that the extreme depravity with which the offences were committed and the merciless manner in which death was inflicted on the victim, brings it within the category of rarest of rare cases which merits the death penalty, as awarded by the Trial Court and confirmed by the High Court.

5.13.4 Non-exhibited Report Inadmissible[5]

Author's Summary

It is a case of forged Document, not bearing thumbprints of alleged signatories. A fingerprint expert report to that effect was on case file. It was not exhibited; nor copy given to accused.

It is a case of comedy of errors. The prosecutor failed to exhibit it/or give its copy to the accused. The trial court did not exhibit it officially. The appellate court failed to correct the lacuna.

The case went to SC. It did not accepted un-exhibited report and acquitted the accused as it was the only important evidence.

Highlights Italics

Relevant Extracts (Verbatim)

8. The learned counsel for the petitioners vehemently submitted that both the Courts below have committed serious error of law in convicting petitioners for the offences under sections 468/120-B and 419/120B, IPC. According to the learned counsel for the petitioner, the prosecution failed to prove that the thumb impression of any of the persons on the sale-deed dated 14-7-1982 (Ex. P. 1) is forged one. According to the learned counsel for the petitioners, out of 10 witnesses, three witnesses PW-5 Hanuman Singh, PW-6 Magan Singh and PW-7 Ganesh turned hostile. From the statements of the rest of the witnesses, even remotely, it cannot be gathered that they have proved thumb impressions of any of the executants as forged one.

The best evidence, which was available to the prosecution was Fingerprint Expert and his report but neither Fingerprint Expert was produced nor even the fingerprint report was tendered in evidence. Even no question was put to the accused about the said report, therefore, the entire finding passed on the alleged fingerprint report is a finding based on no evidence.

Both the Courts below misconstrued the section 293(iv)(g), Cr.P.C. [wrongly mentioned as clause (g) in the judgment of the trial court, the relevant is clause (c)]…A document which is admissible in evidence but has not been tendered in evidence and which has not been proved in accordance with the law, is not evidence in the eye of law. The Courts below failed to draw, distinction between admissibility of a document and its proof. It is also submitted that mere production of document or tendering it in evidence is not sufficient. It is required to be proved in accordance with law. The opinion of Expert is only an opinion and the Expert is required to prove his opinion and unless an opportunity of cross-examination is provided, the evidence of Fingerprint Expert also is of no value. According to the learned counsel for the petitioners, it is a case of no evidence, therefore, this Court can well within its revisional jurisdiction to interfere with the order of the Courts below and the order of conviction is absolutely without jurisdiction as the same is based on no evidence. The learned counsel for the petitioners further submitted that there is no eyewitness who has seen putting thumb impressions of Ramu or Mangala on the document executed. Contrary to it, the evidence of PW-1 Balwant Singh, Tehsildar-cum-Sub-Registrar, PW-4 Mohan Lal, Deed Writer fully proved that the deed was executed by all the executants of the sale-deed dated 14-7-1982.

9. The learned P.P. supported the judgments of the two Courts-below and submitted that both the two Courts-below after appreciation of the evidence finding of fact against the petitioner-accused persons and held them guilty for the offences under sections 468/120B and 419/120-B, IPC. The learned P.P. admitted that the fingerprint report was not tendered in evidence and Fingerprint Expert himself was not produced by the prosecution but at the same time, the learned P.P. submits that the report is admissible in

5. *Chauthu Ram v State of Rajasthan*, 2005 Cr LJ 1051 (SC) : RLW 2005 (2) Raj 775.

evidence and the court can look into the report itself to find out the truth. The trial court as well as the appellate Court, therefore, rightly considered the report of the Fingerprint Expert and they rightly arrived at the conclusion that thumb impression of Mangala and Ramu have been fabricated and forged on Ex. P. 1 sale-deed dated 14-7-1982.

10. I considered the submissions of the learned counsel for the parties and perused the record.

11. The main thrust of the argument of the learned counsel for the petitioner is that the only evidence about putting the forged thumb impression of Mangala and Ramu, relied upon by the two courts-below, is fingerprint report. It is true that the said report was never tendered in evidence nor any exhibit mark has been put on this report. Section 293, Cr. P.C. says that any document purporting to be a report under the hand of Government Scientific Expert to whom section 293 applies, given after examination or analysis by him in the course of any proceeding under the Code of Criminal Procedure may be used as evidence, not only in an enquiry but also in trial and other proceeding under the Code of Criminal Procedure. However, sub-section (2) of section 293, Cr.P.C. Provides that the Court may if thinks fit, summon and examine any such Expert. Therefore, the report which is already available on record and issued by the Director, Finger Print Bureau, Rajasthan, Jaipur, could have been looked into by the courts below. However, this may make the report a piece of evidence and not more than that even under section 293(1), Cr.P.C.

12. Section 313, Cr.P.C. provides that the accused is required to be given an opportunity to explain any circumstance appearing in the evidence against him. If the prosecution intends to use the said report as a piece of evidence, as circumstance appearing against the accused persons, then it should have been put to the knowledge of the accused by the Court by pointing out the accused about the said report so that the accused persons could have explained the circumstances. Since there is no eyewitness to prove the fact that someone else has put thumb impressions of Mangala and Ramu over the disputed sale-deeds, therefore, the fingerprint report was the important piece of evidence and such evidence had not been brought to the notice of the accused persons during trial then said piece of evidence cannot be used against the accused persons. The first appellants Court strangely held that since the fingerprint report was not exhibited in evidence, therefore, there was no cause for putting any question to the accused about the fingerprint report. The reasons given by the first appellate Court appears to be contrary to law. If the argument is accepted that even without tendering in evidence and without exhibiting the fingerprint report, that report can be used as evidence against the accused-petitioners then this is evidence only and not conclusive proof of fact stated in the report. If the prosecution intends to rely upon this report as circumstance against the accused persons then section 313, Cr.P.C. definitely requires that circumstance should have been brought to the notice of the accused.

The report of the Fingerprint Expert is an important document and the entire allegation of having the forged thumb impressions of Mangala and Ramu over the sale-deeds is based upon this report only. In these circumstances, even if it is held that the Fingerprint Expert's report is a piece of evidence, as per sub-section (1) of section 293, Cr. P.C. even then this cannot be used against the accused persons as it was never brought to the notice of the accused persons nor the accused persons were given opportunity to explain the circumstance under section 313, Cr.P.C. Merely on this ground alone, the accused persons deserve acquittal.

5.13.5 Taking of fingerprints without obtaining the order of Magistrate[6]

Author's Summary

Under Section 4 of the Identification of Prisoners Act, 1920 Police Officer is entitled to take fingerprints though the order not taken from the Magistrate. But it is desirable to take the fingerprints before or under the order of the Magistrate to dispel any suspicion. In this case even if, fingerprints of appellant's, chance print Mark (taken from iron safe) was identical to the specimen of left palm impression of Sonvir, it does not complete the chain of circumstances unerringly pointing out fingers to the appellant, that it was the appellant who committed the murder. Thus the appellant stands acquitted of the charges u/ss 302, 392 read with Section 34 of the IPC.

Highlights Italics

Relevant Extracts (Verbatim)

6.5 Forensic Report regarding matching finger impressions provides that the prosecution relied upon the report tendered by the Senior Finger Print Expert of the Fingerprint Bureau, RN Rawat (PW-35), to state that the finger 50 impressions obtained from the appellant matched with the chance prints obtained from the scene of the crime.

The Trial Court and the High Court considered the six chance prints lifted from the first floor of the house by SI Naresh Kumar Sharma (PW-8), incharge of the Finger Prints Bureau, Crime Branch. Chance prints Q1 to Q3 were lifted from the iron box on the first floor, Q4 from the showcase glass, and Q5 and Q6 from the iron safe. The Senior Finger Prints Expert of the Fingerprint Bureau, RN Rawat (PW-35), vide his reports (Ex. PW-35/A and Ex. PW-35/B), opined that the chance print marked Q1 was identical to the specimen right palm impression of Sultan @ Rajesh (Accused No. 1), while chance print marked Q5 was identical to the specimen left palm impression of Sonvir @ Somvir (Appellant-Accused No. 2). The specimen chance prints of both these accused viz. Rajesh @ Sultan (Accused No. 1) and Sonvir @ Somvir (Appellant-Accused No. 2) were taken by the I.O. - SI Amrit Raj (PW-32A), without obtaining an order of a Magistrate whilst the accused were in police custody. This leads to the issue as to whether the report of the Forensic Expert is admissible in evidence, in light of the provisions of the Identification of Prisoners Act, 1920 since no rules have been framed prescribed by the Government of NCT of Delhi.

8. The scheme of the Act indicates that Section 3, Section 4 and Section 5 are separate and independent provisions pertaining to taking of measurements. Measurement has been defined under Section 2(a) to include finger impression and footprint impression. In the present case, it is the Police Officer, who have taken fingerprints of the appellant after he was arrested which is referable to Section 4 of the Act.

31. Under Section 4 Police officer is competent to take fingerprints of the accused but to dispel as to its bona fide or to eliminate the fabrication of evidence it was eminently desirable that they were taken before or under the order of magistrate.

32. Under Section 4 Police Officers are not entitled to take fingerprints until the order is taken from the Magistrate. The observations were made that it is desirable to take the fingerprints before or under the order of the Magistrate to dispel any suspicion.

6. *Sonvir v State of NCT of Delhi*, (2018) 8 SCC 24 : Criminal Appeal No. 958 of 2017, decided on 2 July 2018(SC).

38. The appellant supporting the judgment of the Delhi High Court contends that since Section 4 uses the words "allow his measurement to be taken in the prescribed manner", unless there is a prescribed manner by the rules, fingerprints cannot be taken. The power of the State given under Section 8 to frame rules is an enabling power. The word used under Section 8 is, the State Government "may". Can it mean that till the rules are framed by the State, power under Sections 3 and 4 cannot be exercised? The power given to the Police Officer to ask a person arrested to give his measurements is a substantive power. This power is hedged by the condition that such measurement has "to be taken in the prescribed manner" if there is any prescribed manner that cannot be breached by such Police Officer. Taking of the measurements in the prescribed manner is a procedural part of the Section which does not affect the substantive power of the Police Officer to ask an accused who is under arrest to give his measurement.

39. In the event, it is held that unless the rules are framed under Section 8, power under Section 4 cannot be exercised that will not be in consonance with the very purpose and object for which Section 4 has been enacted. The submission of the appellant further is that when there is no rule framed providing prescribed manner for taking fingerprints, resort to Section 5 has to be taken by IO. Section 5 is a separate power given to Magistrate. The power of the Magistrate is an additional and separate power to secure ends of justice for purpose of investigation and proceedings under Code of Criminal Procedure. It may be exercised even in a case where after arrest Police Officer has not taken fingerprints of an accused. But, it cannot be held that power under Section 4 can be exercised by the Police Officer only after obtaining an order under Section 5.

52. Even if, we accept that fingerprints of appellant's, chance print Mark Q5 (taken from iron safe) were identical to the specimen of left palm impression of Sonvir, it does not complete the chain of circumstances unerringly pointing out fingers to the appellant, that it was the appellant who committed the murder. Law of conviction based on circumstantial evidence is well settled.

54. In result, the appeal is allowed. The appellant stands acquitted of the charges under Sections 302, 392 read with Section 34 of the IPC.

In *Ashish Jain v Makrand Singh,*[7] the Supreme Court has observed that:

pursuant to S. 8 of the Identification of Prisoners Act, rules have been framed by the Madhya Pradesh government for the purpose of carrying into effect the provisions of the said Act.. The relevant rules for the matter on hand are Rules 3, 4 and 5.

A bare reading of these rules makes it amply clear that a police officer is permitted to take the photographs and measurements of the accused. Fingerprints can be taken under the directions of the police officer. As held by this Court in *Sonvir* (supra), although Section 4 mentions that the police officer is competent to take measurements of the accused, but to dispel doubts as to its bona fides and to rule out the fabrication of evidence, it is eminently desirable that they were taken before or under the order of a Magistrate. However, the aforesaid observations cannot be held to mean that this Court observed that under Section 4, police officers are not entitled to take fingerprints until the order is taken from a Magistrate. If certain suspicious circumstances do arise from a particular case relating to the lifting of fingerprints, in order to dispel or ward off such suspicious circumstances, it would be in the interest of justice to get orders from the Magistrate. Thus there cannot be any hard and fast rule that in every case, there should be a magisterial order for lifting the fingerprints of the accused. Thus, it cannot be held that the fingerprint evidence was illegally obtained merely due to the absence of a magisterial order authorizing the same. At the same time, we find that in the current facts and circumstances, the absence of a magisterial order casts doubts on the credibility of the fingerprint evidence, especially with respect to the packing and sealing of the tumblers on which the fingerprints were allegedly found, given that the attesting witnesses were not independent witnesses, being the family members of the deceased.

7. *Ashish Jain v Makrand Singh,* Criminal Appeal No. 1980 of 2008, decided on 14 January 2019 (SC).

Thus, we cannot rule out the possibility of tampering and post facto addition of fingerprints, and concur with the High Court in discarding the fingerprint evidence.

28. It is noteworthy to mention that the DIG of Police had visited the scene of the crime shortly after finding the bodies, which is evident from the deposition of witnesses such as PW1. The DIG, upon seeing three tea tumblers and some electrical equipment at the scene of the crime, inferred that the crime may have been committed by three persons who were electricians. This inference drawn by a high-ranking officer in the police is likely to have impeded the course of investigation and created prejudice against the accused persons. The whole investigation and the prosecution case seem to be concocted around this inference made by the DIG, and such a circumstance does not help the case of the prosecution.

29. In light of the aforementioned discussion and reappraisal of evidence by this Court, there is not any glaring infirmity in the acquittal granted by the High Court.

5.14 ADDITIONAL CASE LAW

5.14.1 Expert Necessary[8]

Relevant Extracts (Verbatim)

4. Fingerprints by implication are to be compared with a disputed fingerprint with the help of the expert. I am not prepared to put the limited interpretation on the words "for the purpose of enabling the court to compare" that the court can itself compare the finger impressions and cannot send them to the handwriting expert directly and invite the opinion of the handwriting expert. No doubt, it would be deemed that the court has itself considered the expert's evidence on this point necessary and the expert may be examined as a court witness. The request in the application was that the finger impression of the accused may be taken and sent to the government handwriting expert by the court. They will of course be sent by the court to the Government expert under its own seal and will not be handed over to the prosecution for making such use as the prosecution may consider necessary. It is true that the complainant himself had no *locus standi* under section 493, Cr. PC. (old), but the counsel for the complainant could move the application under the direction of the public prosecutor and there is nothing to show that the application was moved against the wishes of the public prosecutor. Counsel for the complainant is often allowed by the public prosecutor even to advance the argument. In fact, by the aforesaid application the attention of the court was drawn to this aspect and it was ultimately for the court to be satisfied whether it was a fit case in which it would like to take the fingerprints of the accused for comparison. The order ultimately passed by the learned Sessions Judge was obviously passed on his own satisfaction. There is, thus, no illegality in the order passed by the learned Sessions Judge. It is a perfectly just order.

5.14.2 Fingerprint Evidence[9]

Relevant Extracts (Verbatim)

1. The next and the most important circumstance which establishes the complicity of all the three appellants beyond all reasonable doubt is the tracing of their finger impressions on certain silverwares that were found scattered in the store-room of *"Ranga vilas"* on the morning of 6th June, 1956. P.W. 114 Sri Sivacharan Singh has given evidence to the effect that immediately after recording the statement of P.W. 25 Nagaraj, and submitting the F.I.R. he summoned to the place the photographer and the fingerprint expert attached to the scientific laboratory of police department and requested them to examine the scene and the articles for foot and finger impression, if any. P.W. 108 Thimmiah, the photographer and P.W. 109 Prema, fingerprint expert attached to the laboratory, came to the place at once and examined the several places and the articles for finger and foot impressions. P.W.

8. *Iqbal Ahmad v Ketki Devi*, 1975 All WC 477 : 1975 All Cri C 346 : 1976 Cr LJ 244 (All).
9. *Re* S *Govinda Reddy,* AIR 1958 Mys 150 : ILR 1957 Mys 177 : 1958 Cr LJ 1489 (Mys).

109, Prema examined the premises minutely with the aid of magnifying glass and found some impressions smudged, partial and overlapping in several places and instructed P.W. 108, Thimmiah to take the photographs of them for the purposes of examining them. He also found some impressions on 19 of the silver articles that were lying scattered in the storeroom and showed them to panchayatdars.

He took those nineteen articles to the laboratory for detailed examination with the permission of P.W. 14, Sivacharan Singh, the inspector of police. He developed the latent fingerprints that were on those silverwares with the powdering and processing method and examined them in bright light in the laboratory and found that three of them *viz*. M.O.s 86, 87 and 89 contained finger impressions which were identifiable. He, therefore, requested P.W. 108, Thimmiah to take the photographs of the impressions that he had developed on the three silverwares and enlarge them and furnish him with the positive photographs of these impressions for the purpose of comparison.

P.W. 110 Mohammad Yakoob is the officer-in-charge of the Scientific Laboratory of the Finger Print Bureau. He is an Assistant Superintendent of Police. He had gone to Mereara on official duty on 4th June, 1956, and came back to Bangalore on the evening of 6th June, 1956. P.W. 109 Perma, fingerprint expert, who is working under P.W. 110, Mohammad Yakoob, as an assistant delivered the photographs of the impressions found on M.Os. 86, 87 and 89 to him on 7th June, 1956 for the purpose of examination in the laboratory.

He also delivered all the nineteen articles – M.Os. 81 to 99, to P.W. 110 Mohammad Yakoob, who compared the photographs with the impressions that were found on M.Os. 86, 87 and 89 and found them tallying. He compared the prints on M.Os. 86, 87 and 89 with the three photographs Exhibits P-175, P-176 and P-177 and found them to be the correct photographs of the impressions found on the articles. He also examined the impressions on M.Os. 86, 87 and 89. On 8th June, 1956, P.W. 110 Mohammad Yakoob received the fingertips of the deceased persons Singamma, Vengadamma, Ramalingam, Lava, Kusha and Belur Srinivasa Iyengar.

He took the impressions of the tips of fingers of all those persons and compared them with the enlarged photographs of the impressions found on M.Os. 86, 87 and 89, and found that they did not tally. He informed this fact to the investigating officer on 9th June, 1956 and requested him to furnish the fingerprint impressions of suspects if any, for the purpose of comparison with the developed latest impressions. The evidence adduced in the case makes it abundantly clear that the photographs Exhibits P-175, P-176 and P-177 are the enlarged photographs of the finger impressions found on M.Os. 86, 87 and 89 respectively.

On 11th June, 1956, P.W. 115 Sri Revanna, the investigation officer, directed P.W. 112, Krishnamurthi and P.W. 111, Daffadar Nanjundiah to obtain the thumb impressions of the three accused persons that had been arrested and kept in separate lock-ups in Bangalore City. Accordingly P.Ws. 111 and 112 went to the respective lock-ups and took the finger impressions of all the ten fingers of the three accused persons on Form No. 94 and prepared also the search slips. Exhibit P-191 is one of the fingerprint slips of Govinda Reddy. Exhibit P-190 is one of the fingerprint slips of Krishna and Exhibit P-192 is one of the slips of Muniswamy taken by P.W. 112, Krishnamurthy and P.W. 111, Nanjundiah on 11th June, 1956.

The slips of fingerprints taken from the fingers of the three accused persons were sent to P.W. 115 Revanna and he in turn sent them to P.W. 110 Mohammad Yakoob for the purpose of comparison with the photographs of the latent impressions found on M.Os. 86, 87 and 89. The fingerprint expert compared the impressions found in the fingerprint slips with the enlarged photographs of the latent impressions and found that the two impressions found on M.O. 86 which were marked as "Q" and "Q_1" by him in the photograph Exhibit P-175, tallied with the right ring finger impressions and the right middle finger impression of appellant Krishna, that the impression on M.O. 89 the enlarged photograph of which was Exhibit P-176 tallied with the right middle finger impression of appellant Govinda

Reddy, and the impression on M.O. 87 of which Exhibit P-177 is the enlarged photograph tallied with the right thumb impression of appellant Muniswamy.

P.W. 110 Mohammad Yakoob then directed P.W. 108, Thimmiah, to take the photographs of the impressions of the agreeing fingers from the finger slips. Accordingly P.W. 108 Thimmiah took the photographs in the presence of P.W. 110 Mohammad Yakoob. Exhibit P-193 is the negative of the impression of the right middle finger and of right ring finger Exhibits P-190(b) and P-190(c) respectively and Exhibit P-194 is the enlarged photograph of the right middle finger impression and Exhibit P-195 is the enlarged photograph print of the right ring finger impression of appellant Krishna.

Exhibit P-196 is the negative of the impression of the right middle finger of Govinda Reddy and Exhibit P-197 is the enlarged photograph taken from Exhibit P-191(b). Exhibit P-198 is the negative of the photograph of the right thumb impression of appellant Muniswamy. Exhibit P-199 is the enlarged photograph thereof. P.W. 110 Mohammad Yakoob compared these impressions minutely and carefully in the laboratory and came to the conclusion that the impressions that were found on M.O. 86 were those of the right ring and right middle finger of appellant Krishna that the single impression on M.O. 87 is the Impression of the right thumb of appellant Muniswamy and the impression found on M.O. 89 is the impression of the right middle finger of appellant Govinda Reddy.

The fingerprint expert found as many as fifteen characteristics common between the impression "Q" in Exhibit P-175 and Exhibit P-194, as many as fourteen common characteristics between the impression "Q_1" in Exhibit P-175 and Exhibit P-195 and has described them fully in his written opinion sent to the investigating officer. There were as many as fifteen characteristics that were common between the impression of the right middle finger of appellant Govinda Reddy and the impression that was found on M.O. 89 the enlarged photograph of which is Exhibit P-176.

Similarly the expert found thirteen characteristics which are common to both latent and patent impressions of the right thumb of appellant Muniswamy. The expert who was examined as P.W. 110 in the trial court has been subjected to searching cross-examination and nothing has been elicited to discredit his evidence. The learned sessions judge has accepted the opinion of the expert about the identity of these impressions. The conclusion based on the same by the learned trial judge has been challenged by learned counsel for the appellants on many grounds.

It was contended that P.W. 108, Thimmiah is an amateur in photography, that he had not taken the photographs of all the nineteen articles, photographs of M.Os. 86, 87 and 89 with the impressions on them and that he had not taken the contact photographs of these negatives to show that Exhibit P-195, Exhibit P-196 and Exhibit P-197 are the enlarged photographs of them and, therefore, no value should be attached to them. There is absolutely no substance in any of these contentions. P.W. 108, Thimmiah has stated in his evidence that he is working as a photographer in the police department for the last 25 years.

It is no doubt true that he does not possess any technical qualification inasmuch as he has neither obtained a degree nor a diploma in photography but his experience for over 25 years in photography is sufficient enough to call him as an expert. P.W. 108, Thimmiah has stated in his evidence that he did all what he was directed to do by P.W. 109, Prema and P.W. 110, Mohammed Yakoob and nothing more. The mere fact that he had not taken the photographs of these nineteen articles and the photographs of the three articles M.Os. 86, 87 and 89 with the impressions on them cannot be a ground to discard his evidence. He has stated that he did not feel it necessary to take the photographs of the article with the impressions on them since the articles themselves were likely to be produced before the court for the purposes of comparison.

He has also stated that he took enlarged photographs directly from the negatives and, therefore, there was no need to take the contact prints from them. There is absolutely nothing to doubt the correctness of the statement made by P.W. 108, Thimmiah, about the identity of the articles from which he took the photographs and enlarged them. It was

contended that P.W. 110, Mohammed Yakoob, is not an expert inasmuch as he had not sufficient experience in the matter of comparison of thumb-impressions and the learned trial judge was not justified in entirely depending his opinion upon in coming to the conclusion that the impressions found on M.Os. 86, 87 and 89 tallied with some of the finger impressions of appellants Krishna, Muniswamy and Govinda Reddy respectively.

It is seen from the judgment of the learned Sessions Judge that he did not delegate his duties to the expert of fingerprints. He has not based his conclusions simply because the expert stated that the fingerprints are identical but on the contrary he has on an elaborate, thorough and detailed discussion on the evidence of the expert, agreed with the opinion of the expert. Moreover, the learned trial judge has stated in the course of his judgment that he examined the enlarged photographs of the patent impressions with the disputed latent fingerprints with the aid of magnifying glass and found them tallying.

There is absolutely nothing to doubt the statements of the learned Sessions Judge. The science of comparison of fingerprints has developed to a stage of exactitude. It is quite possible to compare the impressions taken from fingerprints of individuals with the disputed impressions, provided they are sufficiently clear and enlarged photographs are available. The identification of finger impressions with the aid of good magnifying glass is not difficult, particularly when the photographs of latent and patent impressions are pasted side by side. We have ourselves examined the enlarged photographs of the admitted and the disputed thumb-impressions which are pasted on sheets of paper and we have no doubt in our mind that the opinion of the expert is correct.

The opinion of the expert, based as it is on a careful comparison of the enlarged photographs, has not been shattered by the lengthy cross-examination. There is absolutely no reason to think that there is any room for error in matters of this kind. It appears to us that P.W. 110, Mohammed Yakoob, has compared the disputed and the patent impressions carefully and the learned Sessions Judge was perfectly justified in accepting his opinion and basing his conclusion that the impressions found on M.Os. 86, 87 and 89 tally with the right ring and right middle finger impressions of appellant Krishna, the right thumb-impression of appellant Muniswamy and the right middle finger impression of appellant Govinda Reddy, respectively.

5.14.3 Blood-stained Fingerprint[10]

Relevant Extracts (Verbatim)

Presence of blood-stained fingerprint on the wooden Kilini (MO II) is also very relevant. P.W. 11 has stated that he detected partial chance bloodstained fingerprint on MO II. Since the fingerprint was stained with blood it was preserved and taken to the laboratory and he took the photograph in the laboratory. MOs IV and V are negatives of first and second photographs respectively. According to report of the Director, State Fingerprints Bureau (Ext. 38), finger print of accused tallied with finger print on Kilini marked MO II. As has been observed by apex court in *Jaspal Singh v State of Punjab*, AIR 1979 SC 1708 : (1979) Cr LJ 1386 : 1979 SCC (Cri) 920 science of identifying thumb impression is an exact science and does not admit of any mistake or doubt. It is a great incriminating circumstance. Fingerprint was noticed by P.W. 11 much prior to the arrest of accused as found from the evidence of P.W. 8.

5.14.4 Sufficient Evidence[11]

8. The question was raised before the Sessions Judge as to whether a conviction can be based upon the unsupported testimony of a fingerprint expert. There is no rule of law on the point; it is merely a matter of caution whether a court will act on such unsupported

10. *Madan Mohan Raj v State of Orissa*, 1996 Cr LJ 2578 : 1996 (81) Cut LT 314 : 1996 (10) OCR 48.
11. *State of Bihar v Karu Gope*, AIR 1954 Pat. 131 : 1953 BLJR 488 : 1954 Cr LJ 201 (Pat).

evidence or not. The correct principle was defined by S.K. Ghose J. in - 'Harendra Nath Sen *v* Emperor AIR 1931 Cal 441 at p. 442 (A):

I do not think that it can be laid down as a rule of law that it is unsafe to base a conviction on the uncorroborated testimony of a fingerprint expert. The true rule seems to me to be one of caution that is to say, the court must not take the expert's opinion for granted, but it must examine his evidence in order to satisfy itself that there can be no mistake and the responsibility is all the greater when there is no other evidence to corroborate the expert.

Before their Lordships the cases of – *'Bazari Hajam v Emperor,* AIR 1922 Pat 73 (B) and – 'Basjit Singh *v* Emperor' AIR 1928 Pat 129 were cited as authorities for the proposition that it is not safe to rely merely on a critical inspection of a fingerprint made by an expert. The case in AIR 1922 Pat 73 (B), relates to a period before the coming into force of the Identification of Prisoners Act, 1920 (Act 33 of 1920), which authorised the taking of the comparison in court, Bucknill, J. who delivered the leading judgment criticised in strong terms the taking of thumbprint for such a purpose. That decision, therefore, is not in point. The case in - AIR 1928 Pat 129 (C), is not inconsistent with the view which I have just expressed. Jwala Prasad, J. who delivered the leading judgment cited with approval the observation of their Lordships of the Madras High Court in – 'Public Prosecutor *v* Virammal, AIR 1923 Mad 178 (D)' to the effect that a court cannot refuse to convict a person on the evidence of a fingerprint expert merely on the ground that it is unsafe to base a conviction upon such evidence.

He concluded his examination of the authorities thus:

As to the probative value of the opinion of an expert on fingerprints, it must have the same value as the opinion of any other expert, such as a medical officer, etc. In each case the evidence is only a guide to the court to direct its attention to judge of its value. The court is at liberty to use its own discretion and to come to a conclusion either in affirmance or differing from the view taken by the expert.

In this view it may be said that, as has been held repeatedly in a number of cases, that it is not safe to convict an accused upon the sole testimony of an expert. The danger of such a conviction has also been indicated in the decision of the Madras High Court referred to above. Each case however, must depend on its own circumstances.

I, therefore, proceed to examine the evidence of the expert.

9. Exhibits 11 and 11(1) are the reports of the fingerprint expert. Each of them is drawn up in a printed report from which runs thus:

Finger-print marked.... tallies/tally with the specimen .... Thumb impression .... marked ... finger-print on.... bearing number ...

Finger-print marked ... blurred for a definite report.

Officer-in-charge, Finger-print Bureau C.I.D. Bihar, Patna. (Patna)."

The opinion in each case has been given by filling up the blanks in the first paragraph of the form and drawing a link across the second paragraph. Through carelessness in printing the paper book the cancellation of the second paragraph was overlooked and it was printed as it stands. The mistake caused a little confusion as this paragraph is obviously inconsistent with the opinion given in the first paragraph.

The confusion caused by the misapprehension was only removed after we have verified the facts from the original reports. In the reports beyond stating the fact of the tallying of the impressions in question the expert has said nothing. I think it would be better if in such reports reasons for the opinion expressed are given. This should be a simple matter as the expert must keep some note on the points where he finds tallying at the time when he makes his examination of the document for the purpose of expressing his opinion. The setting out of the reasons at length will help to clarify his ideas and it will furnish a valuable guide to the parties and to the court in testing the value to be attached to that opinion. It would also be fairer to the person against whom the opinion is to be used that the reasons for the opinion are definitely expressed. As matters now stand, the lawyer for the accused

does not know till the witness is actually in the witness-box what his reasons are and he had to be prepared without further notice to cross-examine the witness.

10. In the witness-box the witness has given 11 reasons for identifying the fingerprint on the '*hasua*' with the fingerprint of Bhorik and nine reasons for identifying the enlarged photograph Ext. 3 with the impression of the right foot of the accused Bhorik. The enlargement Ext. 3 and the enlargement of the fingerprint on the '*hasua*' are both blurred, and although I have tried to follow the reasons given by the expert I have found it difficult to do so. Even accepting, though as I have mentioned, there is no evidence on the point, that the enlargement Ext. 3 is an enlarged photograph of the bloody footprint found at the scene of the murder. I do not think that it would be safe on this evidence to hold that the presence of Bhorik has been established.

11. So far as Karu is concerned, I would take the contrary view. Both the impressions on which his conviction depends were distinct impressions. There is no doubt of their identity and although the marking in red ink might have been a little more accurate than it is, it is possible to follow the reasons given by the expert for expressing the view that the two sets of impressions tally with each other. The expert gives as many as 14 reasons for identifying the left thumb-impression of Karu with the enlargement Ext. 2/1 of one of the impressions on the wall. The other impression was a small one. But never-the-less the expert gave as many as 8 points in respect of which it tallied with the impression of the left palm of Karu. There has been some discussion as to the different standards adopted by different fingerprint bureau in the matter of the identification of fingerprints. The expert tells us that according to the Patna Fingerprint Bureau 7 points of similarity are sufficient to identify two prints, whereas some other bureaux are satisfied with merely four points of similarity and others require as many as 12.

The question as to what would be a safe standard to adopt hardly arises in the present case where the expert has found so many points of similarity in two different impressions. I would merely observe that I do not think the establishment of identity by a comparison of fingerprints can be reduced to a mere numerical counting of similarities. A bald statement such as appears in the evidence of the expert that point No. 1 is a bifurcation downwards and point No. 4 is a bifurcation upwards is by itself unconvincing. There may be a bifurcation upwards at corresponding points in the two impressions under comparison, but the configuration may be so different at these points that there is no doubt about the two impressions being of different persons. The fact is that a perusal of the opinion of the expert must be accompanied by a visual study of the two impressions which are under comparison. Regarded in this manner it becomes obvious that the probabilities of a difference at each point of comparison are so great that the chances of tallying very rapidly become infinitesimally small when the comparison is made at a number of points. Hence, tallying at a comparatively few points may be sufficient to establish identity.

5.14.5 Proper Processing: No Lacunae[12]

We have examined the evidence of the prosecution regarding the taking of specimen fingerprints of the respondent, their comparison and examination with the fingerprint on the currency note by the Director, Finger Print Bureau, Phillaur, and his report Ex. P-BB. As the impression mark A on the currency note was partly smudged and partly on the design and the printed writing, it was photographically enlarged along with the right middle finger impression of the respondent, and the two photographic enlargements were marked A/A and I/I respectively. The Director has given the opinion that the photographically enlarged impression marked A/A was "partly smudged but, otherwise, it is comparable and there exist sufficient (not less than 8) points of similarity, *i.e.*, matching ridge, characteristic details in their identical sequence, without any discordance, between its comparable portion and the corresponding portion of the photographically enlarged right middle finger impression of Ajit Singh marked I/I. The Director has further stated that he had graphically shown the

12. *Mohan Lal v Ajit Singh*, AIR 1978 SC 1183 : (1978) 3 SCC 279 : 1978 Cr LJ 1107.

eight points of similarity "in their same form and position" and had indicated the "nature, direction and sequence of each point" in its relevant circle. He has expressed the categorical opinion that so many points of similarity could not be found to occur in impressions of different thumbs and fingers and that they were therefore "identical" or were "of one and the same person". There were other impressions also on the currency notes, but they were either sufficiently smudged and partly interfered with by the design and the printed matter or were sufficiently faint and were rejected as unfit for comparison.

Nothing substantial has been urged to challenge the opinion of the Director of the Finger Print Bureau, and all that has been argued is that as there were only eight points of similarity, there was not enough basis for the expert's opinion about the identity of the fingerprints. Reference in this connection has been made to B.L. Saxena's "*Identification of Handwriting, Disputed Documents, Fingerprints, Foot Prints and Detection of Forgeries"* 1968 Edition, page 247, Walter R. Scott's *"Fingerprint Mechanics"* page 62, and M.K. Mehta's *"The Identification of Thumb-Impressions and the Cross-Examination of Finger Print Experts"* 2nd Edition, page 28. We have gone through these books but they do not really support the argument of the learned counsel for the respondent. While referring to the old practice of looking for a minimum of twelve identical characteristic details, Saxena has admitted that the modern view is that six points of similarity of the pattern are sufficient to establish the identity of the fingerprints. Walter Scott has stated that "as a matter of practice, most experts who work with fingerprints constantly satisfy themselves as to identity with eight or even six points of identity." Mehta has also stated that in the case of blurred impressions the view of some of the Indian experts is that if there were three identical points, they would be sufficient to prove the identity. There is no gain saying the fact that a majority of fingerprints found at crime scenes or crime articles are partially smudged, and it is for the experienced and skilled fingerprint expert to say whether a mark is usable as fingerprint evidence. Similarly it is for a competent technician to examine and give his opinion whether the identity can be established, and if so whether that can be done on eight or even less identical characteristics in an appropriate case. As has been pointed out, the opinion of the Director of the Finger Print Bureau in this case is clear and categorical and has been supported by adequate reasons. We have therefore no hesitation in accepting it as correct.

5.14.6 Improper Presentation[13]

I have scanned the evidence of the expert. His statement before the magistrate about the identity of the disputed impression with the undisputed fingerprints of the accused, gives no reasons for his view. How he came to that conclusion was never explained. He merely filed a list of common characteristics, about none of which was anything elicited in the examination-in-chief or even in the cross-examination. The court totally failed in its duty of scrutinising the evidence or making a comparison of the impressions personally. The *ipse dixit* of the expert was accepted and acted upon by the court and the accused was convicted. The sessions court too never discussed the question. In this state of things I felt it necessary to summon the expert and elicit some particulars about the reasons on which his conclusion was based.

He brought a magnifying lens and after some difficulty was able to indicate 2 or 3 ridge characteristics as being common to the disputed and undisputed impressions. I have asked him as to what method he used for making comparisons. He confessed that he made no enlargement on the screen. In most of the impressions the delta was missing and he himself admitted that the core was indistinct and when one of the two fixed points is missing it can only be expected that one set of the delta is lacking. Equality in the number of ridges between the core and delta is one of the sure criteria for comparison. A similarity in the type here the loop can carry no significance because all the millions of people inhabiting the world have their fingerprints falling within

13. *Re Godavarthy Bhashyakaracharyulu*, AIR 1960 AP 164 : 1960 Cr LJ 315 (AP).

4 broad types – Arches, Loops, Whorls and Composites. Similarly in this respect this method cannot be a certain index.

We have then the other test *viz.,* a comparison of the ridge characteristics bifurcations upward or downward, abrupt endings, islands and other features. The expert has pointed out a similarity in respect of 2 or 3 ridges but even after a close scrutiny I have not felt sure that there was such similarity established. He has taken one ridge in the disputed impression and another ridge in the admitted impression without having regard to the number which that ridge bears from the fixed point, *viz*. the core and tried to make the comparison. That is certainly a fallacious approach. The core being indistinct and the delta being absent, the expert ought to have taken some fixed point common to both. When questioned on the technique of comparison when neither of the two, the core and delta is visible distinctly the expert would say that he takes for his scrutiny the areas which correspond to each other, judged roughly by distance and direction from the core and begins making comparisons.

I am not satisfied that it is the correct way. In such cases it is expedient that magnification is made on the screen. The location of the 'corresponding areas' can be geometrically fixed relatively to the core at least, because despite indistinctness its location is certain and then a comparison of the ridge characteristics in the two corresponding areas made.

It is not the moral conviction which the expert has that matters. He must rule out the possibility of all reasonable doubt about the identity of the impressions.

Again the expert states that a commonness in about 5 or 6 ridge characteristics suffices for establishing identity. He quotes no authority for this. The characteristics were not brought specifically to the notice of the court. The court never verified the correctness of the conclusion of the expert.

5.14.7 Uncorroborated Evidence[14]

1. In this case, the prosecution version is that the document in question was presented for registration by accused 1 and not by Bootha Khan Padmanabhan by whom the document was purported to be executed. Accused 1 presented the real executant and placed his thumb-impression on the document as well as in the register Ex. B kept in the Sub-Registrar's office when he presented the document and admitted it. A thumb-print of accused 1 was allowed to be taken in court and P.W. 2 an expert was called in to compare the two thumbprints and say if they are of the same person and on the court's opinion that the thumbs marks are identical, a conviction has been entered. Having disbelieved the evidence of P.W. 3, the only evidence against the accused is the opinion of P.W. 2, the fingerprint expert. There is no reliable evidence as to who caused the original of Ex. A to be written and who signed it and in the absence of the forged document itself, the question arises whether it will be safe to act on the uncorroborated testimony of the fingerprints, expert and declare the guilt of the accused. In Bazari Hajam *v* King Emperor, AIR 1922 Pat 73 the same question arose and Bucknill, J., observed thus*:*

I think that apart from the fact that I should be rather sorry without any other corroborative circumstances to convict a person of a serious crime solely and entirely upon similarity of thumb marks or fingerprints, the very fact of the taking of a thumb-impression from an accused person for the purpose of possible manufacture of the evidence by which he could be incriminated is in itself sufficient to warrant one in setting aside the conviction upon the understanding and upon the assumption that such was not really a fair trial. I know of no law by which an accused person can be either by words, or by exposing himself to certain physical treatment made to implicate himself in the crime with which he is charged. When he is on trial such an idea is highly repugnant to all thoughts of the proper administration of justice in this or any other British country.

The above view was disapproved of by Schwabe, C.J. in Public Prosecutor *v* Kandasami Thevan, AIR 1922 Pat 73 although the point did not directly arise in the case as there

14. *Fakir Mohamad v Emperor,* AIR 1936 Bom 151 : (1936) 37 Cr LJ 539.

were thumb-impressions of the accused in evidence other than that taken by the judge in court for comparison with the thumb-impression in the document alleged to have been forged. The learned Chief Justice did not see any objection in law to the taking of the accused's thumb mark, if the judge trying the case thought that it was relevant at any time. It is unnecessary to cite more cases to illustrate the divergence of opinion on the question among the High Courts in India. On principle it appears to us that the accused could not have been required to furnish any evidence in support of the case for the prosecution. This principle was indicated in the decision cited by us above a summary of which was published in page 69 of Volume IX of the Travancore Law Times. We therefore agree with the view expressed by Bucknill, J., in *Bazari Hajam v King-Emperor*[1] that the practice of taking the thumb-impression of the accused and using it against him is inconsistent with the principle of a fair trial and has to be severely condemned.

As a result of the foregoing discussion, we hold that the conviction and sentence passed by the lower court against accused 1 cannot be legally sustained. We set aside the said conviction and sentence and in allowing this appeal the appellant is acquitted. His bail bonds are cancelled and he is set at liberty forthwith.

5.14.8 Fingerprints provide Definite Link[15]

As regards fingerprints on the '*dibbi*' article 2, it was contended that there is absolutely no evidence to show that the fingerprints were not tampered. It was vehemently argued that the prosecution has led no evidence to show that the fingerprints on the '*dibbi*' article 2, remained intact from that date of seizure to the date they were sent to the fingerprint expert. It was also contended that the fingerprints were sent after an inordinate delay. *Dibbi* article 2 was seized on 9-9-73. But it was sent to the fingerprint expert on or about 29-6-74 *vide* Ex. P 45 and Ex. P 46. The seal with which these fingerprints were sealed was not kept with any independent person. Reliance was placed on *Mahmood v State of Uttar Pradesh*, 1976 Cr LJ 10 : AIR 1976 SC 69 : (1976) 1 SCC 542, wherein it has been held as under:

In a case dependent wholly on circumstantial evidence, the court before recording a conviction on the basis therefore must be firmly satisfied:

(a) *that the circumstances from which the inference of guilt is to be drawn, have been fully established by unimpeachable evidence beyond a shadow of doubt;*

(b) *that the circumstances are of a determinative tendency unerringly pointing towards the guilt of the accused; and*

(c) *that the circumstances, taken collectively, are incapable of explanation on any reasonable hypothesis save that of the guilt sought to be proved against him.*

In the instant case these conditions have not been satisfied. The solitary piece of circumstantial evidence on which the prosecution has stated their case, was too shaky, suspicious and fragile to furnish a sound foundation for conviction. The conviction for the murder rested on the solitary circumstances, *viz.,* that the fingerprints of the accused were found on the handle of the *gandasa* which was found lying near the dead body at the scene of occurrence. But it was found that the investigator did not take all the necessary precaution which could be taken to eliminate the possibility of fabrication of this evidence or to dispel suspicion as to its genuineness. Admittedly, he sealed the box with his seal which thereafter remained with him throughout.

Furthermore, the specimen fingerprints of the accused were not taken before or under the order of a magistrate in accordance with section 5 of the Identification of Prisoners Act.

Even if it is assumed that the handle of the *gandasa* bore the fingerprints of the accused, then also it would not inexorably and unmistakably lead to the conclusion that the accused, and none else was the murderer, unless it was firmly proved further that the fatal injury to the deceased was caused with this weapon. Definite proof of this link was lacking in

15. *Shankaria v State of Rajasthan,* AIR 1978 SC 1248 : 1978 Cr LJ 1251 (SC).

this case. The missing link could be best supplied by showing that there was blood on this *gandasa*, and that blood was of human origin. But this was not done.

Further, the inspector of the Scientific Laboratory has not given any reasons in support of his opinion. Nor has it been shown that he has acquired special skill, knowledge and experience in the science of identification of fingerprints. It would be highly unsafe to convict one on a capital charge without any independent corroboration, solely on the bald and dogmatic opinion of such a person, even if such opinion is assumed to be admissible under section 45, Evidence Act.

Reliance was also placed on the *State v Motia,* ILR (1953) 3 Raj 655, wherein it has been held as under:

Wherever it is desired by the prosecution that certain articles, which have been recovered from accused persons are to be identified, or are to be sent to the chemical examiner for analysis, it is necessary that the officer recovering the articles should immediately take steps to seal them, and evidence should be produced by the prosecution that from the time the articles come into possession of the police to the time they were sent for identification before a magistrate or for examination to the chemical examiner the seals remained intact. In the absence of such precautions it would always be open to the accused to say that the police later put human blood on the articles in same reliance cannot be placed on the discovery of bloodstains on the articles recovered as would be done if necessary precautions are taken:

Further, it is also necessary for the prosecution to prove by evidence that the articles sent to the chemical examiner for analysis, were the very articles which were recovered from the accused.

Reliance was placed on *Hanuman v State of Rajasthan,* 1974 Raj LW 159 : 1974 WLN 95, wherein it was observed that the delay in sending empty cartridge cases and other incriminating articles to the forensic expert was not explained, the accused could not be convicted where the prosecution has been guilty of such dereliction of duties.

On behalf of the State, reliance was placed on *Ukha Kolhe v State of Maharashtra,* AIR 1963 SC 1531 : (1963) 2 Cr LJ 418 : (1964) 1 SCR 926, wherein it was held as under:

Rules 3, 4 and 5 of the Bombay Prohibition (Medical Examination and Blood Test) Rules deal with the medical examination of a person who is produced before a registered medical practitioner under sub-section (1) of section 129A. To an examination to which section 129A does not apply, the Rules would have no application. The law not having prescribed a particular method of submitting specimen of blood collected from an accused person when blood has been collected before any investigation has started, it is unnecessary to consider the argument whether the expression "duly admitted" used in section 510 of the Code of Criminal Procedure means merely in the manner prescribed by rules in that behalf or submitted after taking adequate precautions for ensuring its safety and the blood specimen was collected by a medical practitioner before investigating and thereafter it was handed over to the police officer on demand by him and ultimately submitted to the chemical examiner for his examination, it would be regarded as "duly submitted" within the meaning of section 510, Cr.P.C.

There is no doubt that the prosecution has failed to lead evidence that the fingerprints on the '*dibbi*' article 2, were not tampered with from 9-9-1973 to 29-6-1974 when they were sent to the fingerprint expert. As stated above, there is ample evidence on the record that when the '*dibbi*' article 2 was recovered it was sealed. P.W. 22, Kashi Prasad, has stated that the seals of article 2 were intact when they were sent to the fingerprint expert. P.W. 18 Mr. Tankha has also stated that the seals on article 2 were intact when they were received by him. The most important thing, which is to be kept in mind, is that the fingerprints of one individual do not tally with the fingerprints of any other individual. The science of fingerprint is by itself a complete science for the purposes of identification. In what manner the fingerprints of the accused Shankariya on article 2 '*dibbi*' could be tampered with, has not been argued or suggested. The fingerprints on article 2 have, on examination, been found to tally with the specimen fingerprints of the accused. Tampering of fingerprints on article 2 would mean that some other fingerprints were superimposed or substituted.

But no other fingerprints could be substituted or superimposed which would resemble and tally with the fingerprints of the accused Shankariya. Accused Shankariya in his statement under section 342, Cr.P.C. recorded on 14-6-1974 and 23-6-1974 has not categorically stated that his fingerprints were obtained on an article like the iron '*dibbi*' article 2. In the absence of such a plea by the accused Shankariya, the non-production of some evidence on the part of the prosecution that the fingerprints were kept intact during all this period, loses all its importance. It was also argued that the fingerprints could not subsist for such a long period of 9 months. It has been mentioned in several books on "fingerprints" that fingerprints survive for quite a good number of years. In view of these circumstances, we have no hesitation in holding that the fingerprints on the iron '*dibbi*' article 2 tally with the specimen fingerprints of the accused Shankariya and the non-production of any evidence on behalf of the prosecution to the effect that the fingerprints remained intact during these 9 months does not in any way detract the veracity of the prosecution version, as the fingerprints on the '*dibbi*' article 2, could not be tampered with. As a matter of fact, as stated above, the fingerprints could neither be substituted nor superimposed and therefore, the apprehension of the defence that the fingerprints could be tampered with, in the absence of such an evidence, is wholly unfounded.[1]

Supreme Court's view:

During his examination at the trial, the appellant did not say in positive specific terms, that after his arrest, he was made to handle the *Dibbi* (article 1). What the appellant then stated on this point was as follows:

The police had taken many moulds in the police station after my arrest so also many palm impressions on various things were made. I do not know whether the dibbi was included amongst them or not. When the evidence of the fingerprint expert, Mr. P.N. Tankha (P.W. 18), to the effect that one finger impression on the dibbi*, article 1, tallied with the fingerprint of the left hand of the accused was put to Shankaria, the latter answered: "The witness tells false". This reply would be consistent only with the position that his fingerprints on the dabbi were not taken after his arrest.*

The failure of the appellant to say in categorical terms that after his arrest he was made to handle this dabbi, article 1, cuts at the root of his vague and omnibus plea that all evidence, including that of the foot-moulds, fingerprints, etc., had been fabricated by the police. In the first place, as rightly observed by the High Court, fabrication of the fingerprints in the circumstances of the case was difficult, without superimposition. Secondly, it is impossible to believe that an investigation of the status of a Superintendent of Police, would go to the length of causing substitution of the fingerprints of the accused in place of the original fingerprints of another person on the *'dibbi'*.

Mr. Gambhir next contends that in view of section 5 of the Identification of Prisoners Act, it was incumbent on the police to obtain the specimen thumb impressions of the appellant before a magistrate, and since this was not done the opinion rendered by the fingerprint expert, Mr. Tankha, by using those illegally obtained specimen finger-impressions, must be ruled out of evidence.

The contention appears to be misconceived because in the State of Rajasthan, the police were competent under section 4 of the Identification of Prisoners Act, to take the specimen fingerprints of the accused, and this they did, in the instant case, before the Superintendent of Police, Shri K.P. Srivastava. It was not necessary for them to obtain an order from the magistrate for obtaining such specimen fingerprints.

In view of all that has been said above, the presence of the fingerprint of the appellant on the *dibbi*, article 1, from which cash was stolen at the time of occurrence, is a tell-tale circumstance pointing towards the guilt of the appellant.

5.14.9 The Court's Scrutiny[16]

There is no dispute over the position of law that simply because there is the opinion of the fingerprint expert the court is bound to accept it and base the conviction of the appellant on it. It is a very weighty piece of evidence but nevertheless the court is to consider its weight and is free either to accept or reject it on a thorough discussion and giving sufficient reasons. The court cannot delegate its own function to find a person guilty or not guilty to the expert. He cannot convict simply because the expert says that the man is guilty. The true guidance is received from the judgment of Beaumont, C.J. in the case Fakirmohamed *v* Emperor, AIR 1928 Pat 129.

The court, in a case of this sort, has to rely on the expert upon two distinct points, *first* of all, on the question of similarity between the marks, which is a question of fact on which the court can, and should, with the assistance of the expert satisfy itself: and *secondly* on the point, which is one for expert opinion, whether it is possible to find the fingerprints or thumb-impressions of two individuals corresponding in as many points of resemblance as are shown to exist between the impressions found in the case before the court and those of the accused.

The court should examine the expert as to how much experience he had in the way of comparison of fingerprints and as to how much literature on the subject he had studied.

I will now refer to the decision of Das and Bucknill, JJ. in the case reported in ILR 1 Pat 242. That was also a case under section 82(c) and 82(d) of the Indian Registration Act. Bucknill, J. observed:

I think that, apart from the fact that I should be rather sorry without any other corroborative circumstances to convict a person of a serious crime solely and entirely upon similarity of thumb marks or fingerprints, the very fact of taking of a thumb impression from an accused person for the purpose of possible manufacture of the evidence by which he could be incriminated is in itself sufficient to warrant one in setting aside the conviction upon the understanding and upon the assumption that such was not really a fair trial.

The learned judge was swayed away by the English principles that the accused cannot be compelled to supply incriminating evidence against himself. This point we will discuss later. But it is sufficient to observe here that the observation regarding the fingerprint was rather too general. Das, J. had added a separate note, wherein he discussed the balance of the evidence, and in his opinion, it was entirely in favour of the appellants, the accused persons. That influenced Das, J. to make an observation that it was dangerous to convict the appellants on the sole testimony of the fingerprint expert. In a later decision the court did not stick to the same view. Sir Jwala Prasad and Macpherson, JJ. in the case *Basjit Singh v Emperor,* made a more careful approach to the position. Jwala Prasad, J. in his judgment observed:

As to the probative value of the opinion of an expert on fingerprints, it must have the same value as the opinion of any other expert, such as a medical officer, etc. In each case the evidence is only a guide to the court to direct its attention to judge of its value. The court is at liberty to use its own discretion and to come to a conclusion either in affirmance or differing from the view taken by the expert. In this view, it may be said, as has been held repeatedly in a number of cases, that it is not safe to convict an accused upon the sole testimony of an expert.

But the final conclusion in his Lordship's view is that the court cannot refuse to convict a person on the evidence of a fingerprint expert, merely on the ground that it is unsafe to base a conviction upon such evidence. If the fingerprints are clear enough, the court must verify the evidence of the expert by examining them with a magnifying glass, if necessary, and applying its own mind to the similarities and dissimilarities afforded by the fingerprints, before coming to a conclusion; one way or the other. This decision seems to be more in conformity with the rule laid down by the Chief Justice Beaumont. In our view, the

16. *Bhaluka Behera v State of Orissa*, AIR 1957 Ori. 172 : 1957 Cr LJ 902 : ILR 1957 Cut 200.

direction given in the judgment of the Chief Justice Beaumont referred to above, is a correct and safe guide in matters of this nature and we respectfully follow.

In the instant case, the learned Assistant Sessions Judge has not delegated the duties to the expert of fingerprints. He has not based the conviction simply because the expert says that the fingerprints are identical but on the contrary, on an elaborate, thorough and detailed discussion of the evidence of the expert (P.W. 19), he has agreed with the opinion of the expert. It appears from the judgment that he had also examined the specimen fingerprints and the disputed fingerprints. We have gone through carefully the evidence of the fingerprint expert (PW. 19) and find that he has given very cogent and convincing reasons to come to his opinion. I have also examined the fingerprints with a magnifying glass and agree with the learned Assistant Sessions Judge. The science has developed to a stage of exactitude. But the main thing to be scrutinised is whether the expert's examination is thorough, complete and scientific. The learned Assistant Sessions Judge's approach is in accordance with this direction and we, therefore, find it absolutely safe to convict the accused persons Bhaluka and Kalicharan on the proof of the identity of thumb-impressions on the specimen papers and the disputed ones appearing on the document Ex. 14(4).

5.14.10 Fingerprint Reports[17]

The clinching evidence against the appellant was his thumb impression on the *kunda* of the cash box. It was conclusively proved to be his impression on the opinion of the expert. The report of the expert was used as evidence by the prosecution without examining him in court. Neither the court thought it fit nor the prosecution or the accused filed any application to summon and examine the expert as to the subject-matter of his report. The court was bound to summon the expert if the accused would have filed any such application for his examination. That not having been done the grievance of the appellant apropos the report of the expert being used without his examination in court made in the High Court and repeated in this court had no substance. The evidence of PWs. 13 and 16 against the appellant in court found ample and clinching corroboration from the fact of his thumb impression occurring on the *kunda* of the cash box. Soon after the occurrence during the course of the investigation photographs of the impressions on the *kunda* had been taken long before the appellant was apprehended for his participation in the crime. There was absolutely no scope for any kind of manipulation in the matter as was argued on behalf of the appellant in desperation. We are, therefore, clearly of the opinion that the participation of the appellant in the commission of the robbery at the petrol pump was proved beyond any reasonable doubt; so also the charge under section 342 of the Penal Code.

5.14.11 Identification Basis of Fingerprints[18]

Interest in modern fingerprints identification dates from 1880. With the publication of articles of Henry-Faulds and W.J. Herschel, who was in Indian Civil Service, about uniqueness and permanence of fingerprints, facts which the English Scientist Sir R. Galton was to verify through lengthy systematic observations. Systems of fingerprint classification were developed later by Sir E.R. Henry, formerly of Indian Civil Service and afterwards Chief Commissioner of the London Metropolitan Police and by Juan Vucetich of Argentina. However, the Henry system of classification has been adopted by scores of law enforcement agencies around the world and is the most widely used method of fingerprint classification. All impressions are broadly classified as arches, loops, whorls and composites or compounds and there are further sub-divisions. In arches the ridges run from one side to the other without making backward turn, unlike to loops, whorls or composites. In loop, whorl or composites types there are fixed points, which are known as delta or outer terminus and the core or the

17. *Phool Kumar v Delhi Administration,* AIR 1975 SC 905 : (1975) 1 SCC 797 : 1975 Cr LJ 778.
18. S*tate of Madhya Pradesh v Sitaram Rajput*, 1978 Cr LJ 1220 : 1978 MPLJ 197.

inner terminus. These serve a useful purpose in the classification of fingerprints. Generally there are no deltas or cores in arches. There are also considerable amount of finger details of branching and coalescence of ridges, of island and unlimited quantity of extremely fine pore details along individual ridges. About 5 per cent. of the impressions are arches, 60 per cent loops and 35 per cent. whorls and composites. Loops and whorls always predominate.

For the purpose of comparison of two fingerprints, *i.e.,* the disputed and the specimen, to begin with the patterns are seen. If the patterns are different then the impressions are of different persons. If the patterns are similar then it is seen whether the general flow of the ridges is similar. If the patterns are similar then it is seen whether general flow of the ridge flows are similar, then the ridge characteristics of the two impressions are compared. Two common fixed points are then located. In cases of loops, whorls or composites, core is taken as the inner terminus and the delta outer terminus. Generally speaking, core and delta are not available in cases of arches. So also in partial or blurred impressions such core and delta may not be available. So dot, rod, ridge end, bifurcation, island etc., are taken as the starting point. Similarly outer point is fixed. Having got or fixed the two points, their similarity is determined by counting the number of ridges in between the two points. If the numbers tally, then the sequence of individual ridge characteristics and their relative positions are observed. The points of similarities are then noted. If the relation of each of the points so noted in both the impressions is the same it is an absolute certainty that the impressions are of the same person.

Now the question remains as to how many points of similarities can definitely establish the identity beyond question. The Federal Bureau of Investigation of USA requires twelve and the Scotland yards requires sixteen points of similarities for positive identification. However, some English and American authorities are of the view that if there are five or six 'well-grouped' characteristics and the patterns uncommon, the identification is definite. By well-grouped characteristics, they mean dots, islands, hooks and spurs. If five or six characteristics occur close to one another and in a narrow area, the force of identity is enhanced. In the case of blurred or partial impressions, the view of some of the Indian authors is that if there are three identical points, they would be sufficient to prove the identity. This has been questioned by other Indian authors who insist on at least six points of similarities to establish the identity. The Fingerprints Bureau of different States in India have fixed varying standards, requiring six to twelve points of similarities to determine the identity. In para 88 of the Finger Print Manual of M.P. State it has been observed: "If a sufficient number of ridge characteristics are in complete agreement in the two impressions it can be said definitely that the impressions were made by the same person. However, no definite rule can be laid down for fixing the number of points of similarities. Four or five might be sufficient if there were unusual peculiarities. The consensus of modern opinion is that six, four in sequence, are sufficient to justify a definite opinion being given." It is said that the number is now changed to eight in Madhya Pradesh in view of certain decision of this court. The following extracts from the book *Modern Criminal Investigation* by Soderman and O'Connell may be quoted here in this regard:—

The demand for twelve similar details is the result of the opinion of bygone days, founded on the opinion of Galton, Remus, Balthazard and others. All recent scientists working in the field of dactyloscopy, as for instance, Locard, De Rechter and others, share the opinion that the number of characteristic points which can be noted at the edge of an enlargement is a matter of little importance. A rare detail is an identification sign one hundred times more important than a whole series of forks, four to five details in a centre of an unusual pattern have much more value as evidence than twelve to fifteen forks in the periphery. Some ridges with unusually grouped pores have more weight than the classical twelve points.

The branch of the fingerprint is now a highly developed and technical subject. The classification of fingerprints is a science requiring much study and specialisation in the subject. Therefore, a fingerprint expert is in a more advantageous position to compare fingerprints and point out similarities or dissimilarities between two impressions by critical examination of the impressions. This was recognised by amendment of section 45 of

the Evidence Act in 1899, making opinion of fingerprint expert relevant as was the case with medical and handwriting experts. Section 73 of the Act was also suitably amended, enabling taking of specimen thumb impressions for comparison. Section 510 of the Code of Criminal Procedure was amended in 1955 to make the report of the Director of Finger Print Bureau admissible under that section. The Supreme Court in *Phool Kumar v Delhi Administration,* AIR 1975 SC 905 : 1975 Cr LJ 778 : (1975) 1 SCC 797 has held that when neither the court nor the prosecution or the accused filed any application to summon and examine the fingerprint expert as to the subject-matter of his report, no objection can be taken at the appellate stage by the accused against his non-examination.

Majority of the High Courts have found that it cannot be laid down as a rule of law that it is unsafe to have conviction on the uncorroborated testimony of a fingerprint expert. The true rule seems to be one of caution. The court cannot delegate its authority to the expert but has to satisfy itself as to the value to be given to the evidence of the expert in the same way as to the value given to any other evidence. The reasons given by the expert in arriving at the conclusion are ultimately to be weighed by the court and satisfy itself about the correctness of the conclusion by comparison of the prints. The task of the court becomes much easier when the fingerprint expert has taken enlarged photo prints of the disputed and specimen fingerprints and marked the distinct points of similarities. Otherwise it becomes an uphill task to examine each and every individual prints with magnifying glass when there are large number of prints. If the enlarged photo prints are kept side by side and their marking compared, it becomes much easier to follow the reasonings of the fingerprint expert about points of similarities or dissimilarities and judge the correctness of his conclusion. In *Emperor v Sahdeo,* (1907) 3 Nag LR 1 : 5 Cr LJ 220 it has been observed:

The papillary ridges covering the bulbous points of the human finger and thumb with which finger impressions are produced afford a surer criterion of identity than any other comparable body feature.

Where it is proved by competent expert testimony that two such impressions, made at different times, however far apart, contain several points of agreement and no points of disagreement in their minutiae, no further evidence is necessary to prove that they were made by the same finger.

There are no eye-witnesses in the case and obviously there could be none when the disbursing officer, officer certifying the works, muster-roll clerks and mates who had put their thumb-impression the muster-rolls against the fictitious names of various labourers are all accused persons. As the names of the labourers mentioned in the muster-rolls are all fictitious and to avoid detection the names of their villages were not mentioned and so there was no question of examining any of the labourers to show that they were never paid the wages as shown in the muster-roll. The prosecution case can only succeed if the prosecution is able to prove beyond doubt that the thumb impressions on the muster-rolls are all forged and they are, in fact, the thumb-impressions of the various respondents. The prosecution case, therefore, hinges on the evidence of fingerprint experts. We have the report, Ex. P. 143, of the Director of Finger Print Bureau which is admissible in evidence under section 510 of the Code although he has not been examined as a witness. We have also the report, Ex. P. 142 of Shri Vinayak (P.W. 53) who has been examined in court. The learned judge found the evidence of the fingerprint expert to be not satisfactory and he has given cogent reasons for arriving at this conclusion. It cannot be said that the reasoning of the learned judge is either perverse or unreasonable. In an appeal against acquittal it is not open to interfere even if another view of the evidence is reasonably possible, but here we are satisfied that the reasonings are well merited and there is nothing to differ from the view taken. There were in all about 320 disputed thumb-impressions which were alleged to be those of respondents Hari Singh, Dalu, Khuman Singh, Makhan Singh and Maharaj Singh and were referred to the fingerprint experts. The experts found that out of these 320 impressions some are smudged and are not fit for comparison, still the experts were left with quite a large number of legible fingerprints and it was not at all difficult to conclusively prove that the disputed

fingerprints tally with the fingerprints of the aforesaid respondents. The fingerprint expert Vinayak, (P.W. 53) had taken photo enlargement of only 12 disputed prints. He has also given his reasonings only in respect of these 12 prints though he stated that he had examined the other legible disputed prints with the specimen and he found them to be similar by examining the other prints which were not enlarged by the magnifying glass. It may be mentioned that the reports Ex. P. 142 of Shri Vinayak and Ex. P. 143 of the Director do not tally in all respects. In Ex. P. 142 of Shri Vinayak questioned prints 442, 446, 465, 468A, 468C and 468D are shown as identical but the Director has stated in the report that these prints are unfit for comparison. Questioned prints 550, 554, and 554A have been stated by the expert to be identical but there is no such report about them by Director. Similar is the case with regard to prints 606 and 606A. If there are points of similarities between disputed and specimen prints there is no reason why the expert should differ.

Shri Vinayak admits that the best course to follow is to prepare enlarged photographs of the disputed and specimen prints to the same scale. Then, on the photographs a line may be drawn to connect the centre and the junction points. The lines between the two points should now be carefully counted. The next step is to find out how many agreements in detail there are on either side of the drawn line, such as free ends, forks, ellipses, tongues and rods and to see how they are situated as regards their relative positions with one another. One should also verify that the general pattern is the same in both, but he clearly admits that he did not consider the pattern of the prints. He has failed to take enlarged photographs of all the disputed prints which were subject to examination and comparison by him. He has not marked two fixed points nor drawn a line between the two points, nor he has counted the number of ridges in between. Although he admits that most of the disputed fingerprints were quite legible, still he has only marked out six points of similarities in each of 12 enlargements of the disputed fingerprints. His opinion is mainly based on the ridge characteristics which agree in nature and relative position. Perhaps, he has followed the instructions in the Finger Print Manual of M.P. State but in the Manual it is mentioned that 4 or 5 points of similarities might be sufficient if there are unusual peculiarities. Though normally six points of similarities, four in sequence, are sufficient to justify a definite opinion being given. It is not the opinion of Shri Vinayak that any of these prints had unusual peculiarities nor he has stated that at least four points of similarities were in sequence. This apart he has contradicted his report in the cross-examination in respect of several items. About photo enlargement, Ex. P. 126, he has mentioned that to the east of point no. 3 there is west-ward bifurcation with no ridge intervening but in cross-examination he admitted that point No. 4 is an end of a ridge. Similarly with regard to photo enlargement, Ex. P. 128 he has mentioned that point No. 1 is the end of a ridge and to the east of point No. 3 and after the intervention of 3 ridges there is end of a ridge but in cross-examination he admitted that point No. 1 is an upward bifurcation and is not end of a ridge and point No. 4 is also bifurcation and is not end of a ridge. Under the circumstances the prosecution has failed to prove beyond doubt that the thumb-impressions on the muster-rolls are forged. The prosecution has also failed to show that no work, in fact, has been executed in respect of which these payments were made as per these 13 muster-rolls. We, therefore, find no reason to interfere with the acquittal.

5.14.12 Fingerprint Recovery Doubtful[19]

The only incriminating circumstance on the basis of which the High Court upheld the conviction of Mohd. Aman is that his fingerprints were found on a brass jug in the house of the deceased. From the evidence adduced in proof of the above circumstance it appears that the brass jug, together with other articles, was seized, packeted and sealed on April 14, 1983 and forwarded to the Fingerprint Bureau five days after – on April 19, 1983 to be precise—through Constable Mohd. Sadique (P.W. 4) along with a letter written by the Investigating Officer (copy of which was marked as Ext. P. 59). On the following day, that is, April 20,

19. *Mohd. Aman v State of Rajasthan,* AIR 1997 SC 2960 : 1997 AIR SCW 2980 : 1997 Cr LJ 3567.

1983 the Bureau sent the articles back after taking photographs of the chance prints found on the jug and three other articles (out of the sixteen sent) with a corresponding letter (Ext. P. 60). After Mohd. Aman was arrested on April 20, 1983 his specimen fingerprints were taken by Head Constable Ramji Ram (P.W. 24) and forwarded to the Bureau on May 24, 1983. As the prints were not clear, the same was returned by the Bureau asking for better prints. Specimen fingerprints were thereafter again taken on June 20, 1983 and sent to the Bureau. These prints were also sent back and for the third time prints of Mohd. Aman was taken and sent to the Bureau on June 30, 1983. Thereafter the Bureau gave its report (Ext. 115) with the opinion that the chance fingerprints found on the brass jug were similar to and identical with his specimen fingerprints.

After careful perusal of the evidence adduced in proof of the above circumstance we notice a glaring missing link, in that the prosecution had failed to establish that the seized articles were not – or could not be – tampered with before it reached the Bureau for examination. Though evidence was led to prove that after seizure the articles were packaged and then sealed, no evidence was led to indicate what was the mark given in the seals and whether the Bureau received the packages with the marked seals intact. Indeed, even the contemporaneous letters exchanged between them (Ext. P. 59 and P. 60) do not throw any light on this aspect of the matter. Rather, other circumstances appearing on record makes the prosecution case doubtful in this regard: first, the articles were kept in the police station for five days without any justifiable reason, secondly the Investigating Officer (P.W. 20) admitted that the seal, mark of which was put on the articles, was with him since the time of seizure and lastly his letter (Ext. P. 59) forwarding the seized articles to the Bureau contains admittedly, an overwriting as regards the date of its writing/despatch and no satisfactory explanation is forthcoming for the same. Apart from the above missing link and the suspicious circumstances surrounding the same, there is another circumstance which also casts a serious mistrust as to genuineness of the evidence. Even though the specimen fingerprints of Mohd. Aman had to be taken on a number of occasions at the behest of the Bureau, they were never taken before or under the order of a Magistrate in accordance with section 5 of the Identification of Prisoners Act, 1920. It is true that under section 4 thereof police is competent to take fingerprints of the accused but to dispel any suspicion as to its *bona fides* or to eliminate the possibility of fabrication of evidence it was eminently desirable that they were taken before or under the order of a Magistrate. The other related infirmity from which the prosecution case suffers is that the brass jug, production of which would have been the best evidence in proof of the claim of its seizure and subsequent examination by the Bureau, was not produced and exhibited during trial – for reasons best known to the prosecution and unknown to the court. For the foregoing discussion we are unable to sustain the convictions of Mohd. Aman.

To prove the role of Mohd. Yusuf (the other appellant in Criminal Appeal No. 1749 of 1996) the prosecution relied upon the find of his fingerprint on a glass tumbler and his footprints in the house of the appellant, recoveries of four silver rings belonging to the wife of the deceased and a knife pursuant to his statement. It is rather surprising that even though the investigating agency claimed to have made a searching examination of the house of the deceased on April 14, 1983 and, to have seized on that day sixteen articles, four of which contained fingerprints, the glass tumbler containing the fingerprints was seized and the footprints were noticed on April 24, 1983. When considered in the context of the fact that he was in custody of the police at that time the possibility of fabrication of evidence to implicate him as contended by him, cannot be altogether ruled out. This apart, some of the reasons which weighted with us for not accepting the evidence regarding the find of fingerprints, namely that there is a missing link between the identity of the articles seized and identity of the articles examined by the Fingerprint Bureau and non-production of the glass tumbler during trial also persuade us not to accept the evidence adduced in proof of the above circumstance. So far as the footprints are concerned, another reason for which we feel it unsafe to accept the evidence led in this regard is that the sample footprints were not taken before a Magistrate. This apart, the science of identification of footprints is not a fully developed science and, therefore, if in a given case unlike the present one – evidence

relating to the same is found satisfactory it may be used only to reinforce the conclusions as to the identity of a culprit already arrived at on the basis of other evidence. That brings us to the evidence relating to the recovery of the four silver rings (Exts. P. 5 to P. 8) belonging to the wife of the deceased pursuant to the statement made by Mohd. Yusuf. To persuade the court to hold that the above circumstance stood established the first and the foremost fact which the prosecution was required to prove was that those articles belonged to the wife of the deceased and that they were stolen at the time of the commission of the murder. Having gone through the evidence on record we are constrained to say that the prosecution has not been able to establish those two facts and, therefore, we need not go into the question whether the evidence led by the prosecution relating to their recovery from Mohd. Yusuf is reliable or not. The First Information Report, that was lodged by Sabir Hussain (P.W. 10), did not give any list of articles that were stolen. He, however, claimed to have later on given a written statement containing such a list to the Investigating Officer and this statement was exhibited. In our considered view the trial court was not justified in entertaining the statement as an exhibit because it was hit by section 162, of the Code of Criminal Procedure. Be that as it may, P.W. 10 and Bano (P.W. 2), another relation of the deceased, testified that within a day or two of the murder they could ascertain what articles were missing from the house. The evidence of these two witnesses on this aspect of the matter cannot be safely relied upon for they admitted that they did not have access to the house till May 1, 1983 as it was in custody of the police and, therefore, they could not have occasion to know what articles were stolen. Even if we proceed on the assumption that the seized articles belonged to the wife of the deceased the prosecution has led to no evidence, either direct or circumstantial, to prove that they were stolen at or about the time when the murder took place. In other words, unless the prosecution conclusively establishes that the articles recovered were stolen when the murder was committed, and not on an earlier occasion, there would be a missing link in the chain so far as the specific accusation levelled against the accused is concerned. Once it is found that the evidence relating to finding of foot-prints and fingerprints of the appellant and the recovery of the four silver rings cannot be safely relied upon, the proof of the other two circumstances, namely that a blood-stained knife was recovered after fifteen days of the incident pursuant to the statement of the accused and that few simple injuries were found on his person on April 20, 1983 when he was arrested would only raise a strong suspicion against him and not a conclusive inference of his guilt. The conviction of Mohd. Yusuf, therefore, cannot also be maintained.

5.14.13 Fingerprint Evidence Rejected[20]

This appeal is preferred impugning two judgments and decrees passed by the learned appellate court below namely the learned Additional District Judge, Midnapore in Title Appeal No. 121 of 1984 and the learned trial Judge, *viz.,* the learned Assistant District Judge 3rd court at Midnapore in Title Suit No. 115 of 1976. Both the learned court below held in favour of the respondent Nos. 1 and 2 who were the plaintiffs in the suit. The suit filed by the respondent Nos. 1 and 2, the plaintiffs, amongst other was principally for partition and administration of the properties left behind by one Nandalal Adak, since deceased. In the said suit another relief has been claimed by the plaintiffs for declaration that the deed of gift allegedly executed by Nandalal Adak, since deceased in favour of the appellants herein is not binding upon the plaintiffs and the same are forged and fabricated document. The bone of contention in the present appeal as well as the suit is whether the said deed of gift dated 5th August, 1973 is a valid and lawful document or not. In other words, whether or not the said deed of gift was validly and lawfully executed by Nandalal Adak, since deceased. Both the learned courts below held that the said deed of gift is a fabricated document and the same has not been executed and registered by Nandalal Adak lawfully. During the pendency of the appeal in this court the plaintiff No. 1 along with the appellants herein made an application in this Hon'ble court for compromise. In the

20. *Dulal Chandra Adak v Gunadhar Patra*, AIR 1998 Cal 150 : 1998 Cal WN 190 : 1998 (2) CCC 473.

said compromise petition filed on 10 March, 1988 the plaintiff/respondent No. 1 has categorically stated that the said deed of gift was validly and lawfully executed by Nandalal Adak. In his petition the plaintiff No. 1 has in effect contradicted his own stand in the plaint. At the time of hearing both the parties agreed that I should decide the suit itself, on the basis of the material available before me, as both the judgments and decrees of the learned court below are liable to be set aside under the law. It is submitted jointly that I can do so under O XLII, rule 1 read with O XLI, rule 24 of the Code of Civil Procedure.

Mr. Tarak Nath Roy, the learned advocate appearing in support of the appeal, submits that both the learned courts below have gone wrong while declaring that the said deed of gift is fabricated document upon impersonation. Both the learned courts below came to the conclusion on the basis of evidence of the fingerprint expert and without considering rather brushing aside the direct evidence adduced by the appellants. It is also his submission that averments made in the plaint are inconsistent and/or contradictory inasmuch as the plaintiffs on the one hand admitted the execution and signature of the donor by making out case of undue influence and misrepresentation, on the other hand the plaintiffs have denied and disputed the execution and registration of the donor alleging impersonation and forgery. Therefore, he submits these two allegations cannot run side by side. It is his submission further that where there is a case of undue influence and misrepresentation, the genuineness of the signature and/or thumb impression of the author of the document is admitted. But in the case of forgery and/or impersonation the question of undue influence and misrepresentation is beyond question. He submits further that in the said compromise petition one of the plaintiffs has categorically admitted that the said deed of gift is a valid piece of document, such admission squarely binds another plaintiff namely the other respondent under section 18 of the Evidence Act, 1872. Mr. Roy further submits that the learned trial Judge has exceeded his jurisdiction by not following the order of direction given by the learned appellate court below passed in the order of remand dated (*sic*).

Mr. Basu appearing for the respondent No. 2 submits that all the materials and evidence are galore whereby it will be evidence that the said alleged deed of gift is a forged one. Mr. Basu submits that the case of undue influence and misrepresentation on behalf of his client is not pressed. His client wants to proceed on the basis of forgery. He urges that he should decide this suit on the question of fraud and forgery. He submits it will appear from the evidence of the fingerprint expert and his report that the thumb impression was not put by Nandalal Adak since deceased but by one Kanailal Bara. Therefore, when there is evidence of an expert both oral and documentary on this specialised subject, the court should accept his evidence not other evidence.

Mr. Roy submits in reply to the argument of Mr. Basu that the execution, attestation and registration have been proved by the witness who have personal knowledge of the same. He submits that the evidence of the writer of the document has not made any dent in the cross-examination nor such evidence has been declared to be unbelievable or unacceptable by both the learned court below. He argues that expert evidence cannot overweigh direct evidence. Moreover, in view of the admission of one of the plaintiffs it beyond doubt establishes genuineness and validity of the document. Therefore, the evidence of the learned both the courts below are liable to be set aside as well as the suit should be dismissed.

I have heard the respective submissions of both the parties. I have examined all the materials and evidence on record. As both the parties have agreed to that I should decide the suit itself by exercising my power under O XLII, rule 1 read with O XLI, rule 24 of the Code of Civil Procedure, I accordingly do so. The reasons for exercising my power as above is that both the learned courts below have relied on the evidence of the fingerprint expert and nothing else though the other evidence materials were available. The reasons of the learned appellate court below is that no amount of oral evidence can outweight the opinion of the expert in this regard. In my view this is absolutely wrong approach under the law. The settled proposition of the law is just the reverse and that has been decided by the two decisions reported in AIR 1962 Ori 7,

AIR 1981 (NOC) 93. Both the two decisions have settled that the evidence of the expert cannot outweigh the direct evidence. Moreover, the evidential value of the handwriting expert opinion is not a substantive one but a corroborative. The opinion of the handwriting expert can be taken into consideration under (the ordinary circumstances, when there is a clear and direct evidence for purpose of corroboration only. This proposition has been settled by the decision of the Apex Court of this country reported in *Shashi Kumar Banerjee v Subodh Kumar Banerjee*, AIR 1964 SC 529. In paragraph 21 of the said judgment it is amongst other held ".....besides it is necessary to observe that experts evidence as to handwriting is known evidence and it can rarely, if ever, takes the place of substantive evidence. Before acting on such evidence it is usual to see if it is corroborated either by clear direct evidence or by circumstantial evidence....."In this case there is no clear direct evidence adduced by the plaintiffs/respondents as observed by me as aforesaid nor there is any circumstantial evidence exist which can take the help of the corroborative evidence of the fingerprint expert. In this case both the learned court below even did not touch nor even consider the direct oral evidence. Both the learned court below even did not discard the evidence adduced by the defendants of the attestation and execution. On these grounds alone the judgment and order of the courts below are liable to be set aside. After doing so I could have remanded the suit for trial but I have refrained myself from doing so as this is a suit of 1975. Accordingly, I have accepted the submission and agreement of both the parties to decide the suit itself.

I have taken into consideration all the materials placed before me up to the stage of the second appeal. It will appear from the plaint that the basis of impugning the deed is undue influence, misrepresentation (in paragraphs 14 and 16 of the plaint, and fraud forgery, impersonation and fabrication in paragraphs 17 and 19). This allegation of undue influence and misrepresentation, however, at the appellate stage have been withdrawn altogether by one of the plaintiffs being plaintiff No. 1. The allegation has been denied in the written statement by the defendant. The plaintiffs have not been able to bring any witness or adduce any evidence directly to rebut direct evidence of defendants on the point of registration and execution and attestation. The plaintiffs relied on the evidence of the fingerprint expert only. The evidence of the plaintiffs themselves cannot be accepted as they cannot have any personal knowledge and/or direct evidence as to the execution, attestation of the said deed of gift. Moreover, the allegations made in the plaint on the fact of it are inconsistent and/or contradictory. Mr. Roy rightly submits that the allegation of undue influence, misrepresentation cannot run side by side with the allegation of forgery and fabrication. The allegation of undue influence, fraud and misrepresentation admits of automatically, beyond any doubt, the genuineness of the signature. Therefore, going by the averments made by the plaint itself, the said document has been signed and executed by the donor. Of course, Mr. Basu tries in the second appellate court, to improve upon his client's case by abandoning the case of undue influence, misrepresentation. In my view, this cannot be done under the law at the appellate stage by the learned counsel by making oral submission, as the averment made in the pleading having effect of admission, cannot be allowed to be abandoned without the same is explained away by cogent and proper evidence. At this second appellate stage, plaintiff No. 1 has not come forward to explain away such admission genuineness of signature. Rather, plaintiff No. 2 who was compatriot of the main action has categorically admitted the case of the defendant Nos. 1 and 2. Accordingly, by reason of inconsistent and contradictory case made out in the plaint and further admission of the co-plaintiff and oral direct evidence adduced by the defendants, I hold that the report and evidence of fingerprint expert are of no assistance on the point of execution and registration of the deed of gift in question. The admission of one of the parties having the same interest with that of another party who are fighting jointly for the same interest squarely binds the other. This proposition of law will be apparent from the provisions of section 18 of the Evidence Act, 1872, which is reproduced below:

Statements made by a party to the proceeding, or by an agent to any such party, whom the court regards, under the circumstances of the case, as expressly or impliedly authorised by him to make them, are admissions.

Statements made by parties to suits, suing or sued in a representative character are not admissions, unless they were made while the party making them held that character.

Statement made by—

(1) persons who have any proprietary or pecuniary interest in the subject-matter of the proceeding, and who make the statement in their character of persons so interested, or

(2) persons from whom the parties to the suit have derived their interest in the subject-matter of the suit, are admissions, if they are made during the continuance of the interest of the persons making the statements.

My above view finds support also from the old decisions of this court reported in AIR 1917 Cal 487 : AIR 1918 Cal 971 : AIR 1963 Ori 45.

It appears from the materials that, apart from the admission of the plaintiff No. 1, and the direct oral evidence of the DW 1, DW 2 and DW 3 beyond doubt prove lawful, valid, attestation, execution of the said deed of gift. In that view of the matter, now the plaintiff No. 2 has failed to prove (the case made out in the plaint. Accordingly, the suit is dismissed and judgment and decree passed by the learned both the courts below are set aside. In result, appeal succeeds and is allowed on contest with costs as against respondent No. 2 assessed at Rs. 1,020.

On 30 September 1997, Mr. Roy, learned advocate prays for stay of operation of the judgment and order. In my view, there is a substantial question of law involved in this matter and the same requires some consideration by the apex court. Accordingly, the stay is granted for a period of four weeks after a long vacation, certified copy of this judgment and order shall be given on urgent basis, if applied for.

5.14.14 Judge not to Act as Fingerprint Expert[21]

In this case, inasmuch as the execution of promissory note itself has been disputed, the thumb impression as available in the suit promissory note, is very much under dispute and requires to be either substantiated or disproved by the parties. As far as the trial court is concerned, the court took into account the circumstances that the plaintiffs had filed a petition for sending the document along with the admitted thumb impression to the expert. However, the plaintiffs did not take further steps to pursue the petition filed by them in the said context. Inasmuch as the thumb impression was disputed the initial burden of proving the thumb impression was very much on the plaintiffs. Therefore, and also in consideration of other circumstances the learned trial Judge came to the conclusion that the suit promissory note was not properly proved. However, the learned appellate Judge on a mere comparison of the disputed thumb impression along with the thumb impression of the defendant in the written statement had come to the conclusion that both were the same and that there was absolutely no difference or variation between the two thumb impressions. The question is as to whether the approach of the learned appellate Judge can be sustained or not. Mr. M.M. Sundaresh, learned counsel for the appellate has referred to several judgments in support of his submission that such a comparison by the court in the absence of the opinion of the expert cannot be safely relied upon.

Reliance is placed on the judgment of the Supreme Court reported in *O. Bharathan v K. Sudhakaran,* JT 1996 (2) SC 384 : AIR 1996 SC 1140 : 1996 AIR SCW 685. It was a case arising under Representation of the Peoples Act, in which the Supreme Court has held that in the judgment under appeal the learned Judge ought not to have taken the hazardous task of adjudicating upon the genuineness and authenticity of the signatures in question even without the assistance of a skilled or trained person whose services could have been easily availed of. The Supreme Court relied on an earlier judgment *State (Delhi Administration) v Pali Ram,* AIR 1979 SC 14 : 1979 Cr LJ 17 : (1979) 2 SCC 158. In the said judgment the Supreme Court has held that there was no legal bar to the Judge using his

21. *Bomma Naicken v Chinna Gounder,* AIR 1998 Mad. 375 : 1999 (1) CCC 190 : 1998 (3) Mad LW 407.

own eyes to compare the disputed writing with the admitted writing even without the aid of the evidence of any handwriting expert, but the Judge should, as a matter of prudence and caution, hesitate to base his finding with regard to the identity of a handwriting which forms the sheet-anchor of the case and that it was therefore, not advisable for a Judge to take upon himself the task of comparing the admitted writing with the disputed one.

Reference was also made to another judgment of the Supreme Court *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197. The Supreme Court after analysing sections 45, 47 and 73 of the Evidence Act, came to the following conclusion (paras 10 and 11):—

Evidence of the identity of handwriting receives treatment in three sections of the Indian Evidence Act. They are sections 45, 47 and 73. Handwriting may be proved on the admission of the writer, by the evidence of some witnesses in whose presence he wrote. This is direct evidence and if it is available the evidence of any other kind is rendered unnecessary. The Evidence Act also makes relevant the opinion of a handwriting expert (section 45) or of one who is familiar with the writing of a person who is said to have written a particular writing. Thus, besides direct evidence which is of course the best method of proof, the law makes relevant two other modes. A writing may be proved to be in the handwriting of a particular individual by the evidence of a person familiar with the handwriting of that individual or by the testimony of an expert competent to the comparison of handwritings on a scientific basis. A third method (section 73) is comparison by the court with a writing made in the presence of the court of admitted or proved to be the writing of the person.

Both under section 45 and section 47 the evidence is an opinion, in the former by a scientific comparison and in the latter on the basis of familiarity resulting from frequent observations and experience. In either case the court must satisfy itself by such means as are open that the opinion may be acted upon. One such means open to the court is to apply its own observation to the admitted or proved writings and to compare them with the disputed one, not to become a handwriting expert but to verify the premises of the expert in the one case and to appraise the value of the opinion in the other case. This comparison depends on an analysis of the characteristics in the admitted or proved writings and the finding of the same characteristics in large measure in the disputed writing. In this way the opinion of the deponent whether expert or other is subjected to scrutiny and although relevant to start with becomes probative. Where an expert's opinion is given, the court must see for itself and with the assistance of the expert come to its own conclusion whether it can safely be held that the two writings are by the same person. This is not to say that the court must play the role of an expert but to say that the court may accept the fact proved only when it has satisfied itself on its own observation that it is safe to accept the opinion whether of the expert or other witnesses.

Therefore, according to the Supreme Court, comparison of two disputed signatures would depend upon the analysis of the characteristics in the admitted or proved writing and that the opinion of the deponent whether by an expert or otherwise is subject to scrutiny by the court. Where an expert's opinion is given, the court must see for itself and with the assistance of the expert come to its own conclusion whether it can safely be held that the two writings are by the same person.

In contrast, Mr. A.K. Kumaraswamy learned counsel for the respondents, relies on a judgment of a Division Bench of this court reported in (1993) 1 Mad LW 186 (*Muniswamy R. v P. Pandiarajan*, A.S. No. 107 of 1983, decided on 3 December 1992 (Madras High Court)) in which the Division Bench has held that it was open to the court to compare the disputed signature in a document without calling for an expert witness.

The outcome of the above judgments would be that even though there is no bar for the court to compare the admitted signatures with the disputed signatures to come to its conclusion it would be prudent to require the assistance of an expert witness. In fact all the judgments cited by both the parties related to signatures and not thumb impression. It cannot be disputed that thumb impression would stand on a different footing when compared to signatures and the variations in thumb impression cannot be easily Judged by naked eyes. That being so the caution emphasised in the judgment of the Supreme Court reported in (AIR 1979 SC 140 supra) and as followed in the subsequent judgment reported

in *O. Bharathan v K. Sudhakaran,* JT 1996 (2) SC 384 : AIR 1996 SC 1140 : 1996 AIR SCW 685 (*supra*) has to be borne in mind in the present case more so because the dispute is with reference to a thumb impression. Once it is concluded that the disputed signature is that of the defendant all the other disputes raised by the defendant in the matter of execution of the promissory note would be naturally thrown out and the plaintiffs would be entitled to a decree as prayed for. In a case of this type, the lower appellate court ought not to have resorted to a mere comparison without seeking the assistance of an expert.

In the result, the appeal has to be remanded back to the lower appellate court for sending the documents for the opinion of the expert and thereupon take evidence of necessary only in the context of the opinion of the expert and record his finding thereon. The lower appellate court is directed to send the document for the opinion of the expert of the expenses of the plaintiffs/respondents and to proceed further.

CHAPTER 6

TRACK MARKS

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Fig. 6.1

Then Le Dru knelt, removed his own left shoe. The first joint of the big toe of the left foot was missing. The plaster cast tallied with his left foot exactly. "I, messieurs," he said, "am the murderer" Le Dru 1888.

6.1 GENERAL

The culprit approaches, stays and then leaves the scene of occurrence. He leaves track marks on and around the place in the form of prints and impressions (collectively called 'marks') of feet, shoes, tyres, hoofs and the like. The evidence often connects the criminal with the crime conclusively. It should, therefore, be properly understood/collected/evaluated and used in the dissemination of justice.

Track marks are available in most of the situations. The criminals know the evidentiary value of fingerprints. They are not aware of the importance and utility of the foot, footwear or tyre evidence that, like fingerprints, they can link them with the crime. They, consequently, do not bother about the track evidence. The evidence, therefore, is available in most of the cases. It is handled expeditiously, lest it is mutilated.

6.1.1 Utility

The track marks help the criminal justice system in many ways, including the following:

1. They establish the presence of the culprit at the scene of occurrence.
2. They give the number of the culprits if the visitors or others do not trample the scene and destroy the marks.
3. They help to track down the criminals to their houses or hide-outs, especially in India where most of the people live in rural areas and the criminals, often follow untrodden routes; fields, gardens and stream beds. They leave track marks on routes used before and after the commission of the crime.

   In an infamous murder case, the trackers were able to follow the track of the culprits for miles. The charting of the route ultimately proved useful as the persons who had met the culprits en route proved useful witnesses. (CH)
4. They help to ascertain the type of vehicle used: whether it is a cycle, scooter, car, bus, truck, tractor, rickshaw, bullock cart or a buggy. It is possible to identify the individual vehicle from the tyre marks in some cases. They also indicate the number of vehicles used.
5. They indicate the animals/beasts involved in a crime. For example, a horse or a camel may be used for transport or escape; a cow, a buffalo or a bullock may be stolen or a dog or a tamed wild beast, like a snake or a tiger may be used to destroy or kill a human being or a domestic animal. The type of the animal or the beast has its characteristic track marks. They may permit identification of the individual animal also, in some rare cases.

6.1.2 Misconceptions about Track Evidence

The track marks evidence is misunderstood and hence not fully utilized in India. The Apex court [1] (the Supreme Court) has dubbed it as a **'Rudimentary Science'** and that **'not much reliance can be placed on track mark evidence'** in a judgment in the following words.

> *The science of identification of footprints is no doubt a rudimentary science and not much reliance can be placed on the result of such identification. The track evidence, however, can be relied upon as a circumstance which, along with other circumstances, would point to the identity of the culprit . . . though by itself it would not be enough to carry conviction in the minds of the court.*

These epitaphs of the Apex Court became the case law for the lower courts. They take them as the final word on the evidence and ignore the evidence altogether. This is unfortunate.

The science of identification of track marks has advanced in recent years from a mere aid to a definite scientific proof. It is hoped that it will be given its rightful place in criminal investigations and trials in the coming future.

The following excerpts from the writings Forensic Scientists in the field not only illustrate the status the science as a definite scientific discipline but also indicate the vast possibilities of the evidence.

> *1. If there is found to be identity of fine details, such evidence is conclusive that the impression was made by the particular shoe examined. The chance that two soles should be stamped out in such a manner that there is exact agreement in pattern is so small that it is negligible.*
>
> *Peculiarities of wear which have been caused by some deformity of gait are also conclusive.*

1. *Pritam Singh v State of Punjab,* AIR 1956 SC 415 : 1956 Cr LJ 805 (SC).

Peculiarities of wear caused by defects such as cuts, holes, tears and so on, because they are adventitious, are quite conclusive.

Peculiarities of repairs are also conclusive…[2]

2. The importance of an impression (defined traces in the form of fingerprint, palm-print, footprint, tool mark or wearing apparel mark) as evidence lies in its uniqueness. A given impression can be produced by one finger only; a certain shoe-print will correspond to only one shoe; a jimmy mark will bear the unique characteristics of the jimmy. Naturally, this uniqueness is invaluable as evidence; it can be established, however, only if there are a sufficient number of characteristic marks discernible.[3]

3. Erring on the side of generosity (to the defendant), we should expect to find only one such pair of heels, if we were to examine ten billion pairs; or, again, the odds are ten billions to one against finding another pair of heels which will make prints to correspond to the prints found at the scene of the crime.[4]

4. Even as in the comparison of fingerprints, a portion of a heel print, if it has sufficient number of similarities may be identified definitely as having been made by a certain shoe.[5]

5. Footwear identification has advanced, in recent years, from a mere 'aid to investigation' to an accepted laboratory technique on a level with ballistics and fingerprint examinations. In the past two decades, court rulings have increasingly accepted footwear evidence as positive proof of presence, even in the most serious offences.[6]

6.2 NATURE

Track evidence is varied in nature; naked footmarks, footwear marks, paw marks, hoof marks, tyre marks, skid marks, drag line of a load, impression of a stick or pug marks of a beast are included in the track evidence. Individual marks and their collective patterns (gait patterns[7]) are both useful in the identification of individuals.

A mark may be a print or an impression. A mark having length and breadth without appreciable depth or height is a print. A mark with length, breadth and height or depth, having three dimensions, is an impression. The terms print and impression have been used indiscriminately in literature. We have used the term 'mark' to include both prints and impressions. Marks may be visible (patent) or invisible (latent).

Foot and footwear form impressions on pliable surfaces like soft clay, mud, snow, etc.. They are sometimes called plastic marks.

Objects smeared with powders and liquids leave prints on various surfaces. Thus, a toe, a foot or footwear smeared with dust, ink, oil or blood leaves a print. They also leave prints on oiled, waxed or dusty surfaces even without being smeared.

Principles and methods for the evaluation of all marks are alike, though some collection techniques differ for prints and impressions.

Track marks are divided into classes for the convenience of their study:

2. Nickolls, L C, *Scientific Investigation of Crime*, 1956, pp 148–49.
3. O'Hara, E C and Osterburg, J W, *Introduction to Criminalistics*, p 75.
4. O'Hara, E C and Osterburg, J W, *Introduction to Criminalistics*, p 676.
5. Jones, L V, *Scientific Investigation and Physical Evidence*, 1959, p 74.
6. Abbot, J R, *Footwear Evidence*, 1964, p 9.
7. The gait pattern has acquired tremendous importance in recent years. The gait pattern of a criminal, captured in a CCTV camera, is being utilised for his identification.

6.2.1 Naked Footmarks

Quite a large percentage of people in India, including majority of criminals in rural areas, usually move about barefooted. The naked footmarks are, therefore, found at and around the scene of occurrence, frequently.

Ordinarily, the footmarks in crime situations have evidence deficit, mainly for the following reasons:

1. The foot transfer incomplete mark to the registering surface.
2. The surface registering the mark is not congenial to register the mark.
3. The main identifying features in naked footmarks are the ridge details, the phalange marks and the crease marks. They do not leave their marks most of the time due to the structure of the foot and nature of the recipient surface.
4. The foot usually leaves gross marks from heel, toes and front part of the sole. They do not possess many identifying features. Often gross/incomplete shapes of the heel and toes are registered. They do not provide enough identifying evidence.
5. The Supreme Court verdict has killed the initiative of the IO to collect the evidence, unacceptable to the court. He collects the evidence callously and that also rarely.

It is against this background that the positive and definite identity of the footmark is not established in all cases, and the use of the evidence has not been exploited properly.

On the other hand, footwear marks are identified in respect of the footwear in most of the cases (~ 80 % cases). The belief of the judiciary, the bar and the investigating officer that the naked footmarks are more valuable than the footwear marks is, therefore, not correct. The forensic value of the footmark, if identified, is, of course, greater because it links the culprit directly with the crime. In case of footwear marks, it is necessary to establish that the culprit owned and wore the particular shoe at the material time as the footwear mark identifies the footwear and not the wearer. The latter must be established by other evidence. In this respect, the marks and the wear pattern on the insole and the uppers of a well-worn shoe can be quite helpful in many cases.

6.2.2 Footwear Marks

Footwear marks include the marks of shoes, sandals, chappals, socks and like. The footwear may be factory-made or hand-made. It may be made of leather, partly or wholly, rubber (natural or synthetic) or plastics. Cloth is used in canvas and other shoes.

In some parts of India, strings, from a variety of fibres, are also used to make shoes. A fairly large number of persons in India, especially in rural areas, wear handmade leather shoes. The number is decreasing fast. Rubber is being used increasingly for soles. The number of factory-made shoes is also increasing. Foreign brand shoes have also invaded the market.

Some religious persons wear wooden shoes. They are worn only for short distances, as they are not very comfortable for walking long distances. The advent of rubber and plastic shoes has reduced the number of wooden shoes and their bearer.

The soles and the uppers are joined together through stitches, nails or with adhesives. The uppers are made of leather, rubber, plastics or canvass. Stitching, nails or their combination were common previously. Now, adhesives and stitching are used increasingly.

The footwear evidence suffers from one great drawback. If the culprit is not apprehended soon after the crime and he continues to wear the shoes, the additional wear and tear will change the original surface pattern and may not allow definite inter-linkage of the shoes and

the of the marks. The time after which the marks become unidentifiable varies with the extent of use or misuse, nature of the sole material and the terrain in which it is used. In actual cases, it seldom happens, the shoes are recovered soon after the occurrence.

In one case, a footwear mark was correctly identified in respect of the shoes recovered after six months. The culprit used the pair of shoes only for the commission of crime. (CH)

It is advisable to get the footwear compared even when it is recovered after a considerable interval of time. The pattern may not have changed much.

6.2.3 Gait Pattern

The art of tracking culprits through gait pattern is an ancient art. Certain tracker families practised it in various parts of India. The trackers were/are known as *Khojis* or *Paggies*. The police forces had frequently utilised their services for tracking. Some of them joined police service. The art/science of tracking has declined since, mainly due to urbanisation, metalled roads and increasing use of vehicles.

The trackers were, mostly, uneducated persons. Yet they have developed a uncanny sense for appreciation of peculiarities, distances, angles and pressures in foot, footwear and allied marks. They follow the track of individuals, animals, drag marks or even stick marks for miles, ultimately guiding the police/search parties to the destination (houses or hiding places) of the person being followed from the left marks. Likewise, they could follow foot or hoof marks of the animals and locate the stolen or runaway animals.

Further, if they observed the gait pattern of an individual at the scene of occurrence or on routes of ingress or egress, they could identify the individual in identification parades, picking up the person from a number of persons of similar constitution by observing their gait patterns.

The trackers do not take any extensive measurements, nor do they take down any notes. They create the impression that they have an uncanny power to identify the culprits.

Gait pattern has been studied scientifically also. The individuality of the gait pattern is established from the following:

1. Direction line (DL)
2. Walk line (WL)
3. Foot line (FL)
4. Foot angle (FA)
5. Step angle (SA)
6. Step length (SL)
7. Step Width (SW)

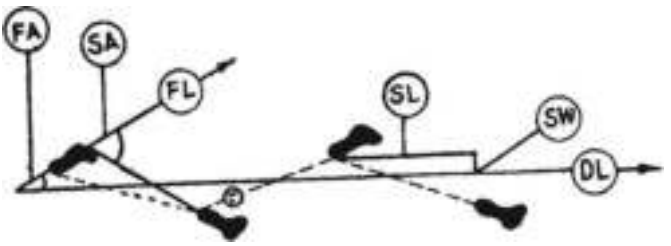

Fig. 6.2

Elements of a gait pattern at least four consecutive foot or footwear marks are essential to determine gait pattern.

In addition, the following characteristics are taken into consideration:

1. Dimensions of the mark
2. Peculiarities in the marks
3. Pressure points
4. Pressure defects
5. Missing or additional toes

There is evidence to believe that the trackers take most of the above factors into consideration to follow the track or to identify the individual in an identification parade.

It was not customary to study and evaluate gait pattern evidence by forensic science laboratories staff because it required at least four consecutive foot or footwear marks. They are available at the scene of occurrence only. The investigating officers were unable to gather the evidence collectively on the same format to permit gait pattern studies. It is possible now through video filming or photography of the evidence groups of four or more foot/footwear marks. Such consecutive photographs (or marks in video film), If sent to a laboratory, it would permit evaluation of gait pattern.

As the clarity of the individual marks is not so important in gait pattern studies, it is expected that gait pattern evidence can help in the identification of the individuals. The gait pattern will be useful where the individual foot or footwear marks do not carry sufficient individualising features; for example, in sandy places.

6.2.4 Footwear

Sometimes a culprit under tension may leave one fellow or a pair of footwear at the scene of occurrence. If only one fellow of the shoe is left at the scene and the other is recovered from the suspect, the matching of the two shoes provides strong evidence, linking the criminal with the scene. Likewise, the matching of the wear patterns of the pair left at the scene with a similarly worn-out shoes of the suspect often gives useful results.

> *In an interesting case, one fellow of the shoe was found at the scene of occurrence. It was suspected to be that of the murderer. The other fellow of the pair was recovered from a suspect's house. The shape, the construction, the patch and stitch work and the wear patterns inside and on the uppers proved useful to link the two fellows of the shoes. It was a Punjabi shoe where the two fellows of the pair are worn interchangeably. (CH)*

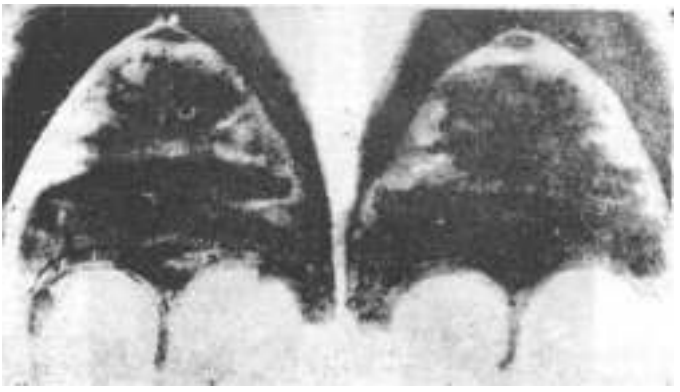

Fig. 6.3

Uppers show similar material, workmanship, wear and creases.

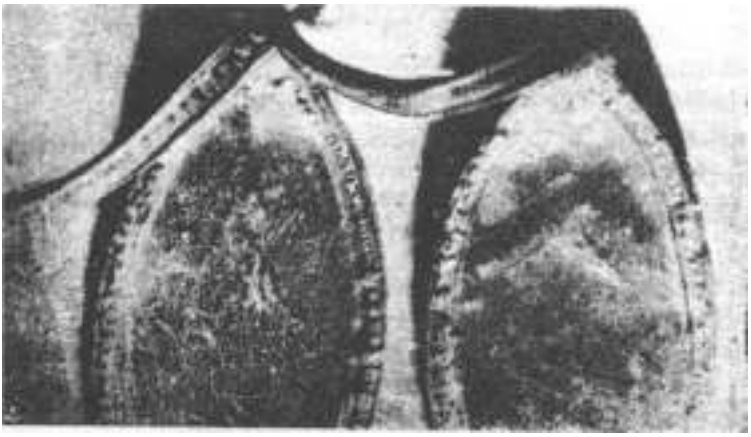

Fig. 6.4

Insoles carry evidence of similar material, craftmanship, wear and tear. the feet have not left identifiable prints.

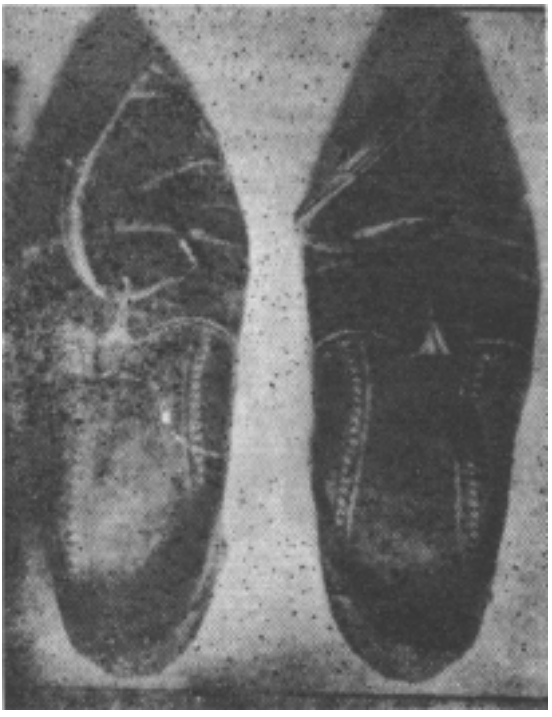

Fig. 6.5

The two fellows of the pair of shoes indicate complete similarity in material, manufacture, design and wear.

6.2.5 Extraneous Matter

Footwear also picks up dust, dirt, paint, glass and other materials from the terrain on which the wearer walks. The study of these traces proves useful in cases where the places visited have characteristic soil or dust. For example, the shoe will pick up the flour in a flour mill, coal from a colliery, dye from a dye factory, and fibres from a cloth mill and so on. Even the soils from different places give significant variations when chemically analysed.

The extraneous traces picked up by the footwear vary tremendously with the places of visit. They also vary with the structure and the structural material (especially of the sole) of the footwear. In a survey, all types of shoes were examined for traces they carried. The very common types of traces (gums, hairs, fibres, and paper pieces) were excluded from the survey. It was found that 60% of the shoes carried traces and about 40% shoes of all categories did not carry the traces. The following traces were observed:

Table 6.1

Material	Percentage
Glass	37
Gravel/sand	34
Metal fragments	12
Plant materials	10
Soil/plant residue	5

Residues are the deposits, which the wearer of the footwear or the naked foot leaves at places he visited. These deposits may be dust or dirt, residues of grease, blood or of any other fluid or solid substance picked up by the foot or footwear and deposited at the site. They are processed as given below:

- The marks are photographed.
- If the marks are on portable object, the object is taken to the laboratory.
- If the object bearing the mark(s) cannot be carried to the laboratory, the mark is lift after photography.

6.3 PROBLEMS/POSSIBILITIES

The evaluation of track evidence provides answers to the following questions:

1. Have the footmarks come from the feet of the accused/suspect?
2. Did the shoes of the accused/suspect leave the footwear marks at the scene?
3. Was the person who left track marks, running, walking or standing?
4. Is the footwear (recovered from the scene) of the accused/suspect?
5. Have the extraneous traces found on the footwear of the suspect/accused come from the crime scene terrain?
6. Which species of the animal has left the hoof/paw/pug marks?
7. Did the suspected animal leave the given hoof/pug/paw marks?
8. What type of vehicle left the given tyre marks at the scene?

9. Did the suspect vehicle/tyres leave the given tyre marks?
10. What was the speed of the vehicle at which the vehicle created the given skid marks?
11. Can we link the tyre rubber residues, left in the skid marks or at the given scene or to the given tyre(s)?
12. How long will the shoes, after the crime, continue to give comparable marks?
13. Can we give the age of the lifted impressions?

6.4 LOCATION

One expects to find track marks at all the scenes of occurrence. The investigating officer, therefore, should pay particular attention to locate them. His failure to find track evidence can be due to only one or more of the following reasons:

1. He arrived at the scene of occurrence too late. The traffic/ weather/public mutilated or destroyed the marks. The prompt arrival of the investigating officer (or his deputy) at the scene, therefore, cannot be over-emphasised.
2. He has not searched the scene thoroughly.
3. He has not been able to locate the culprit's arrival/departure routes correctly.
4. He has not been able to pinpoint the points of ingress/egress.
5. The culprits/ their well-wishers have destroyed the track marks.
6. The crime site terrain is uncongenial to register track marks.

The track marks are found at many places including:

1. The scene of occurrence,
2. On the routes of ingress or egress, and
3. At the places where the culprit has halted on the way to or from the scene for holding meeting with his colleagues, for distribution of the booty, for making a check of the haulage, for disposal of the incriminating or unwanted articles, to attend to the call of nature or to hide himself temporarily when interrupted.

The IO, on intelligent mental reconstruction of the crime, can identify these places. Track marks are found undisturbed at some such unsuspected places. He checks the following places thoroughly for the evidence.

6.4.1 The Scene

The scene of occurrence is the most important place for the track marks. The criminal stays and moves about there to commit the crime. However, they are often found intermingled with the marks of the victim, onlookers, visitors, friends and relatives of the victim. If the scene is not protected/preserved immediately, the original marks are mostly obliterated.

The search for the foot and footwear marks at the scene of occurrence should start from the focal point of the crime. For example, body of the victim is the focal point in a case of murder, a chest or an opened box is the focal point in a burglary case and so on. Search is extended to the entire scene systematically. Floors, furniture, showcases, cupboards, ventilators and windowsills are checked for both visible and latent prints.

If the culprit has visited a garage, he is likely to leave prints on the greasy surface of the garage floor.

The culprit may get his foot or footwear smeared in blood. He is, then, likely to leave prints in blood near the blood pool.

6.4.2 The Routes

The track marks found on the routes, followed by the culprit are often not disturbed by the curiosity hunters. The routes, therefore, is searched thoroughly after fixing the likely places where the disturbance is the least.

The garden of the house where an occurrence takes place is searched carefully. Some soft flowerbeds may have been trampled. If the culprit hid in a bush or other thick growth, the places are checked thoroughly for foot and footwear marks. In addition, the culprit may hide incriminating articles like knives, swords, firearms, clothes and the like. The hiding place is usually secluded and, therefore, the foot and footwear marks found at such a place may be found in good condition.

The entrance point: a door, a window, a ventilator or a roof is examined. If the place is covered with dust or is polished, the place is likely to bear foot or footwear marks of the culprit.

Dust deposited on window and ventilator sills usually retains the foot or footwear marks for a considerable time.

6.4.3 Conference Site

If the place of assembly or conference (usually a secluded place in a rural area) is located, it is searched for foot/footwear marks. The evidence discovered may indicate the number of culprits and their linkage through track marks.

6.4.4 Parking Place

If a vehicle is used, it should be ascertained where it was parked when the crime was committed. The place bears tyre marks, oil or grease drops, dislodged materials etc. The vehicle often carries dust, dirt etc. from other places. It may drop some of it at the spot, which may link the vehicle with the spot.

The place where the vehicle has been reversed, sometimes, carries clear track marks from all the tyres, which also prove useful to link the vehicle with the crime.

Location of surface prints on polished or greasy surfaces is often difficult and cumbersome. They are best located in the dark (at night, if necessary) using oblique light. A strong torchlight proves adequate in most of the cases. If the presence of print is suspected, the place is protected during the day, and the print is photographed at night.

New imaging techniques have facilitated the task.[8]

The track marks on routes followed by a culprit are located through trackers and police dogs.

6.5 COLLECTION

The collection of track marks is an important task in criminal investigation. Investigating officers are specially trained in various collection techniques. Training is fortified with practice (experience) which most of the IOs lack. The result is that the lifts are usually of poor quality and do not permit definite identification. Sometimes, the terrain of the site is such that it does not register the mark adequately.

8. See chapter 27 on Digital Image Forensics.

6.5.1 Materials Required

An investigating officer requires the following materials while collecting track marks:

1. **A good digital camera**

   If police photographer is accompanying IO, with his equipment, the investigating officer need not carry a camera.

2. **De-sensitized bromide paper**

   Both black (exposed) and white (un-exposed) dried bromide paper is required. They are softened at the scene of occurrence by immersion in hot water for a few minutes. Or, fifteen centimetres wide transparent adhesive tape and some thick transparent plastic sheets are used instead. The latter are replacing the bromide papers now. They are convenient.

3. **Plaster of Paris**

   About one kilogram plaster of Paris is required for one impression.

4. **Aluminium flexible strip**

   An aluminium strip, about one metre long and 3 cm wide is required to make retaining wall.

5. Shellac solution, mineral oil and talcum powder.

6. Miscellaneous other materials needed are wax, resins, plastic powders, modelling clay, sulphur, lead, woods' metal, plasticine, rubber bowl, spoon, sieve, wire gauze strips and flit pump (sprayer).

Plaster of Paris is the most frequently utilised material to prepare casts of impressions of feet, shoes and tyres. It is easily miscible with water to give a fluid of uniform consistency. It starts solidifying after about fifteen minutes and is set after about two hours. The casts can be lifted safely, thereafter.

6.5.2 Collection Techniques

The following collection techniques are common:

1. Tracing

It is the crudest but the easiest way to record a track mark. A glass (or preferably a plastic sheet) is held over the mark, and the outline of the mark is traced on the sheet. The details of the mark, such as wear and tear patterns, repair work, nails and stitches are indicated at the appropriate places in the sketch. In the case of naked footmarks, the shape of the toes, the inner and outer margins, the phalange and crease marks are drawn at appropriate places.

The value of a traced mark depends upon the artistic and observation skills of the investigating officer. It is highly subjective. Consequently, the technique is not valued. In fact, it is not used now. Modern photography, digital imaging, lifting and casting have made the tracing technique obsolete.

6.5.3 Photography

The track marks are photographed in all cases. While taking photographs one should:

1. Keep the lens of the camera parallel to the surface on which the mark is found. It should be just above the mark, at a height that gives clear and sharp image and fill the screen. The camera on a tripod gives better results.

2. Arrange the aperture of the diaphragm in such a way as to get ample depth of field to cover points at various levels in the impression. For this purpose, a sharp focus of an intermediate point with fully opened aperture is obtained and the aperture is suitably closed.
3. Place an identification chit (containing case number with date, police station, district and initials of the photographer) along with a scale.
4. Select a suitable format of the film to get a clear photograph of the marks. A format of 4″ × 5″ was considered to be the best in olden days, 35 mm camera ruled the roost till recently, now DSLR (Digital Single Lens Reflex) camera of high resolution are replacing the film camera/photography.
5. Take four photographs of the same mark; two with lighting from both sides at angle 45° and two with single oblique lighting from either side, to ensure capture/recording the finer details.
6. Photograph the surface prints at night, as they are difficult to photograph during daytime. A flood light is thrown obliquely from different positions and the marks are photographed.
7. Take the mark bearing object to the laboratory whenever possible. It is easy to photograph the prints under artificial light.
8. Requisition the services of a professional Forensic photographer (a laboratory or a police photographer) to photograph the marks in difficult situations.
9. Choose a high quality/high pixel DSLR camera. These cameras offer many advantages[9]:
    - The quality of the recorded image can be checked there and then. The unsatisfactory images are eliminated and replaced with new images.
    - The processing is highly convenient; no studio work and ample possibilities of manipulation (enlargements, contrast control, brightness and colour management, segmentation, trimming, etc.)
    - It is time and cost effective.

The three-dimensional photography should be more useful in sunken impressions. It is not used extensively, because of cumbersome presentation of the photographs in courts.

6.5.4 Lifting

Marks are lifted only after they have been photographed.

Lifting, ordinarily, disturbs/mutilates the original mark. Lifting, therefore, is a **'now or never'** process. It brooks no negligence or incompetence.

In some cases, it may be possible to pick up a second lift, but the quality of the print is often poor and may not provide adequate evidence for comparison.

The lifting techniques vary with different surfaces and materials. The following ones are common:

1. A bromide photographic paper sheet is taken. It is desensitized by fixing it. After removing the excess water, it is placed over the print and pressed uniformly. The particles of the print are attached to the gelatin surface, and outline of the print is obtained on the paper.

9. See chapter 27 on Digital Image Forensics.

If the print is found in white (or light shade) powder, an exposed bromide paper is developed and fixed. The sheet thus obtained will be dark in colour. It provides a necessary contrast to the lifted print.

2. If adhesive tape of sufficient dimensions is available for lifting foot or shoe prints, it is used to lift the marks as in fingerprints developed by powders.
3. The thin layer of dust usually registers the track marks more clearly than most of the other media. But the marks are easily overlooked and equally easily destroyed. One has to take proper care in locating, preserving and collecting them. Cellulose acetate solution is sprayed over the impression in such a way that the nozzle of the sprayer is pointed upward and the solution falls on the impression by the gravity alone. Thus, the spray stream does not disturb the impression. Sufficient solution is sprayed to form a firm thick film. After evaporation of the solvent, the film is peeled off. It carries the mark in the dust.
4. Greasy and sticky marks and marks made by shoes smeared in blood or liquids on any surface are lifted by first dusting the marks with a powder and then lifting the dust prints after removing the excess powder by blowing off the excess powder in the usual way.
5. The lifting of the prints in liquids or dried liquids is difficult and requires pre-treatment of the surface. Sometimes it is not possible to lift worthwhile prints from the same. Photography alone is used in such situations.

The investigating officers usually lift the track marks. A specialist in the field helps them in important cases. We have in India some specially trained officers posted in some districts. The specialists are also available in the training institutions of the police forces and forensic science laboratories.

The lifts are protected with transparent sheets of celluloid or glass for their study and presentation in the courts.

6.5.5 Casts

The casting process is a method of choice in 3-dimensional marks (impressions) especially when the mark has appreciable depth. Such marks are common in mud, snow and sand, etc. Proper casting process picks up the details of the marks efficiently. Photography may not pick up all the minute details in some situations.

Casting spoils the impression almost completely. It is, therefore, necessary that the impression is photographed before preparing a cast of the same.

A variety of materials: plaster of Paris, wax, resins, plastic powders, modelling clay, sulphur, lead, woods' metal, plasticine and the like, are used to prepare casts. Plaster of Paris is, however, the most frequently used material.

In the preparation of casts, one should:

1. Remove extraneous matter (such as, grass, twigs, stone, etc.) from the impression, provided the removal does not disturb or mutilate the impression. If there is even minimal danger for mark disturbance, the matter in not removed.
2. Spray shellac solution (shellac dissolved in spirit) over the impression. The nozzle of the sprayer is kept close to the impression and pointed upward, thus, the solution falls upon the impression by gravity. The air or solution does not disturb the impression. Spray sufficient solution to get a 'skin' of shellac over the impression.

3. Spray mineral oil over the shellac layer. Mineral oil permits easy separation of the shellac layer from the casting material. Sewing machine oil serves the purpose admirably.

   Note.—Steps (2) and (3) are required only when the impression is in soft dust or sand that are likely to be disturbed and altered by the ingoing Plaster of Paris solution.

4. Place an aluminium strip frame (about three centimetres in width) around the impression as close to the impression as practicable to avoid wastage of plaster of Paris. The frame acts as retaining wall for the solution.
5. Pour plaster of Paris solution[10] in the impression at an unimportant place *(e.g.,* instep) to avoid damage, due to pouring or flow, to the marks in the impression. It is allowed to flow slowly until it fills the impression and acquires a thickness of about one centimetre.
6. Reinforce the cast at this stage by putting wire gauze pieces, length and breadth wise. If wire gauze pieces are not available, soaked wooden or sack cloth pieces are placed instead.
7. Pour more Plaster of Paris solution until it acquires a thickness of about two cm.
8. Allow the cast to set for about ten minutes. The details of the case: case number with date, police station and date of lifting, signatures of the investigating officer and witnesses are then engraved on the mould.
9. Allow the cast to set for another ten to fifteen minutes. It is set hard by this time and can be lifted.
10. Remove adhering earth from the impression bearing area by washing the cast under a gentle stream of tap water, with palm. Do not pull out embedded debris.

    A Soft brush is used to remove the dirt.

11. The cast dries up, for transportation in about two days in dry weather.

The technique is modified under special circumstances.

6.5.6 Impression in Mud

Remove as much water as possible by siphoning off the water with a rubber or plastic hose without disturbing the impression. Spray powder of Plaster of Paris over the impression till a thickness of about two centimetres is reached and the cast is allowed to set for about fifteen minutes before removal. Use plaster of Paris solution if the impression does not contain sufficient water.

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10. Plaster of Paris solution is prepared at the scene and used immediately before it starts setting.
    The solution is usually prepared in a rubber bowl. The bowl is filled to two-third level with water and plaster of Paris is sprinkled in it with a sieve. The plaster tends to remain dry on the surface when the solution becomes saturated. Sprinkling is stopped. The solution is mixed thoroughly with hands to remove any air bubbles, clumps or gritty matter. The solution, when ready, is of the consistency of cream.
    High quality plaster of Paris is used to get worthwhile casts, as there is only one chance for casting the impression. Usually, plaster of Paris used by the dentist is used.
    Addition of common salt increases the setting speed. Dilute acetic acid (vinegar) retards the setting.

6.5.7 Impressions in Snow

For an impression in snow, one should:

1. Spray ice-cold talcum powder with an atomizer on the impression.
2. Spray ice-cold shellac solution over the powder and pour ice-cold plaster of Paris solution in the impression.
3. Remove when set.

OR

1. Sieve in ice-cold plaster of Paris to form a thin layer over the impression.
2. Pour in ice-cold solution of plaster of Paris.
3. Remove when set.

In the last method, the marks bearing surface is brittle and needs careful handling.

Pour molten sulphur in the impression in the snow. Molten sulphur forms a thin layer on coming in contact with ice or snow. The immediately formed layer provides heat insulation for sufficient time, and sulphur picks up the details of the impression on cooling.

6.5.8 Specimens

It is always better to compare the track marks with the original source creating the marks. Thus, in footwear, tyre or socks marks the suspected sources are seized, packed, sealed and sent to the laboratory for comparison.

For the comparison of the naked-foot or the hoof marks, specimen impressions have to be prepared. A piece of land is thoroughly prepared. The suspect is made to walk on the piece of the land to create a number of impressions. The best impression for each foot is selected. The cast is prepared in the usual way.

The specimen impressions should be sunken or shallow corresponding to the crime impressions.

The specimen surface prints are obtained on paper by inking the foot of the suspect with fingerprint ink and pressing the foot over a paper.

If an adhesive tape of sufficient width is available, it is used to take the print. The foot is smeared with appropriate fingerprint powder, pressed on the adhesive tape to register the footmark. The tape is pasted on a transparent plastic sheet to protect the print. Alternatively, the lifted impression is protected by covering the print with a fresh length of the tape. Superimposition of the prints permit direct comparisons.

Three specimens with varying degree of smearing are obtained for comparison purposes.

6.6 INNOVATIVE TECHNIQUES

6.6.1 Holography

A British scientist, Dr Bradford has promoted a laser technique for recording foot or shoe prints on carpets, which are invisible and otherwise difficult to record.

The technique works because the fibres of a carpet are compressed by a shoe or foot when a person walks over it. The compressed fibres tend to resume their original positions.

Though visually the fibres do not appear to do so, in actual practice the fibres take quite a long time to come to their original positions. A laser beam is able to record this compression on a photographic plate. The outline of foot or footwear and the surface characteristics of the tread such, as patterns, nails, cleats, and wear and tear are recorded by the variations in the depressions on the carpet. The laser beam records the actual positions of the fibres at various intervals of time when they tend to come back to their original position after the compression. The technique is known as holography, and the photograph is known as a hologram.[11]

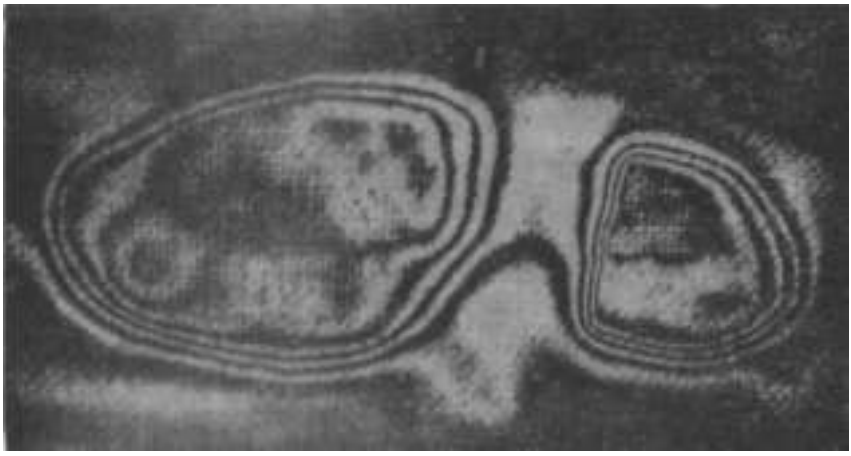

Fig. 6.6

A hologram obtained from a carpetted surface with the newly developed technique. holography.

The actual position of the fibres at a given interval can be a fair index to the time elapsed since the fibres were compressed. Thus, the rough age of the prints can also be estimated.

6.6.2 Electrostatic Technique

The National Police Academy, Tokyo, has evolved a new technique[12] for lifting invisible foot and footwear marks on floors or floor covering. It is based upon the principles that the dust particles can be lifted at high voltage on to a vinyl sheet, where they can be photographed or fixed on a gelatin paper.

The process involves the following steps:

1. Take a black vinyl sheet and cover the area suspected to bear foot or footwear marks.
2. Cover the sheet with an aluminium foil. Apply a high voltage of about 15,000 volts to the foil.
3. Photograph the mark formed on the vinyl sheet.

11. Bradford, W.R. 1976.
12. Kato Masao, 1973.

Larger sheets to cover the whole room or whole path can be used. Only equipment is a transformer which is a box measuring about 30 × 25 × 20 centimetres, weighing about 3 kilograms.

A culprit entered a house for theft. The owner got up and a fight ensued. The culprit, however, managed to escape after injuring the owner. With the electrostatic technique six clear prints were lifted.

Routine questioning, some days later, indicated one suspect to be the possible culprit. His shoes were checked. Comparison with the questioned prints established them as the source of origin. (CH)

Fig. 6.7

Dust prints through Electrostatic deplar

6.6.3 Periphography

Periphography is useful to record the whole tread of a tyre. The camera is called the periphery camera. The movements of the film and that of the tyre are so synchronized that a continuous photograph of the circular surface is obtained on a straight strip. The technique is also useful in firearm and fingerprints on curved surfaces.

6.6.4 Latent Prints Processing

Latent foot or footwear prints are processed like latent fingerprints. A good fingerprint powder, preferably magnetic powder, is sprinkled with a brush. Magna brush technique is preferable. The developed print is photographed and may also be lifted if found on an object, which cannot be moved to the laboratory. Otherwise, the object is taken into possession and sent to the laboratory.

Latent tyre prints are being collected by a new technique.[13] The latent print is exposed to ultraviolet rays. The prints fluoresce and give visible images. They are photographed.

13. Lloyd, J.B.F. 1976.

Fig. 6.8
Tyre Prints in UV light

6.6.5 Silicone Casts

Silicones are new plastic compounds.[14] They have the advantage that they do not adhere strongly to the materials with which they come in contact. Under proper conditions, they harden quickly. Consequently, they are useful to lift prints and shallow impressions from sloping and curved surfaces. Prints even from walls can be lifted by slowly spraying a solution of the silicone plastics.

6.7 EVALUATION

It is believed that every mark has an individuality[15], which cannot be duplicated even with the best of human skill and scientific techniques. The individuality in a given mark is established from the following features:

1. Dimensions
2. Shapes
3. Patterns
4. Peculiarities

14. Boyle, J. 1975.
15. It may not be possible in some cases to prove the individuality.

In all marks, general dimensions should correspond with the source creating the mark. If the dimensions of mark vary to an inexplicable extent, the suspected source could not have created the questioned mark. The foot and footwear marks have tremendous variations in dimensions and the differences permit quick elimination of certain suspected sources.

The dimensions of the casts vary due to nature and quality of the surface, shrinkage or expansion of foot, footwear, their marks and casting materials and especially how it was created (standing, walking or running). However, the variations in dimensions are within limits. Ordinarily, variations are less than 5%. They should not exceed 10% unless there are special conditions, which account for the extraordinary variations.

The shapes of the foot and footwear vary tremendously. The variations help both elimination and identification of the suspected sources.

The naked foot may be normal, flat, curved or one of the infinite variations in-between the main types. The same is true of toes. Similarly, the shape of footwear depends on the whim of the wearer and of the manufacturer. Pointed toes, flat toes, wide heel, narrow pencil heel and many intermediate variations are seen. The number of variations observed was really fantastic in India, mainly because we were using hand-made shoes, on order. Thousands of shoemakers daily made shoes to order according to the fancy of the customer.

Handmade footwear had/have an individuality of its own. Many factors contribute to create the unique shoes. In addition to design, materials, sizes, etc., the shoes differed in their stitch, nail and patch work patterns. This uniqueness of the shoe is also transferred to the marks they produce. It was/is, therefore, far easier to link the mark with the shoe in hand made shoes.

The naked foot bears papillary ridges patterns. They are not transferred in the incriminating marks at the scene as the registering surface in not congenial for the transfer. However, if the surface I polished, prints thereon may carry the ridge details. Fingerprint experts evaluate them.

The tyres manufacturers usually have their own different tyre surface (tread) patterns. The tread marks indicate the brand name of the tyres. The patterns help quick elimination/further comparison.

Peculiarities due to manufacturing defects, damage, and wear and tear are individualistic in nature. They permit linkage of tyre marks with the tyre.

6.7.1 Naked Footmarks

Many persons walk bare-footed in India. Naked footmarks are, therefore, found in the investigation of crime especially in rural areas.

The following characteristics of naked footmarks help to identify the person who left the foot mark:

Fig. 6.9

Typical naked footmark. ridge patterns, toe patterns, creases, worts' marks are visible.

1. Margins

In naked footmarks, the margins are characteristic, sometimes. The margins consist of the outline of the heel and the inner and the outer boundary lines of the foot. The heel may be oval or round; the outer margin may be straight, bulging outward or inward or it may be irregular. The inner margin may be inward or straight or it may be of intermediate shape. Some deformed feet may leave separate marks for heels and soles. The inner and outer margins are discontinuous in such cases.

2. Toe Marks

The shapes and the sizes of the toes vary greatly. If the toe marks are properly imprinted, they give characteristic identification features. Riding toes, long and short toes, missing toes, partially cut toes and damaged toes sometimes offer useful characteristics for identification. The presence of an extra toe, its size and position are often highly characteristic and may be sufficient by themselves for identification purposes.

3. Toe or Ball Line

The line formed by the toes at their junction with the sole is often characteristic. It may be straight, curved or bulging. It may have one, two or more humps. Alternatively, it may be irregular. Toe line (known as *zanjiri* among trackers in India) is a very useful, identification feature.

4. Phalange Marks

Phalange marks are created by the phalanges of the toes. Their presence, position, and sizes are useful for identifying features. They are found in the footmarks, frequently.

Fig. 6.10

Fig. 6.11

The toe pattern and crease marks establish the identity of the culprit.
Figure 6.10 Mould lifted from the scene. Figure 6.11 Test mark mould.

5. Crease Marks

They are found in the instep and the sole of a foot. Their presence, positions, sizes and shapes are characteristic and permit positive identification of the mark in most of the cases, whenever they are available.

Crease marks are not often imprinted in footmarks.

6. Pits, Cracks and Cut Marks

The soles of the feet of persons who habitually walk bare-footed, suffer damages to form pits, cracks or cuts. The entities leave their corresponding marks in the imprints. The damage is individualistic in nature and permits definite identification of the mark in respect of its source, thus linking the mark with the person.

Fig. 6.12

Fig. 6.13

The mould (Fig. 6.12) lifted from the scene and the chappal (Fig.6.13) recovered from the suspect, link the criminal with the scene.

6.7.2 Footwear Marks

The identification of a footwear mark is possible even when the same is incomplete because it carries a number of identifying features. The heel carries the maximum details. It is also impressed with force. Heel marks alone may identify the shoe sometimes.

The following footwear features help in the identification of footwear marks:

Fig. 6.14
Ample Wear and Tear Evidence

1. Wear Patterns

The wear and tear of a shoe depend upon the gait of the wearer, any foot or leg defect, injury, the extent of its use or misuse and the terrain on which it is used. It also depends upon the quality of the material of the sole and the craftsmanship of the shoemaker. No two persons have the same walking habits, nor do they walk on the same or similar terrain. It is also not possible to make two shoes exactly alike. Therefore, the wear patterns of each fellow of a pair of shoe (even of the interchangeable type) are expected to be different. Experience in the examination of hundreds of pairs of worn shoes has confirmed the same. The wear pattern of every fellow of a pair of shoes has always been found different.

The wear and tear or damage to the sole and heel, nails, stitches and patches form the mark pattern. It is characteristic and proves useful in positive/negative identification of the mark.

2. Repairs

If a sole of a shoe has been repaired, individuality is conferred on the shoe. The patches, the stitches and the nails used in the repair are never same in size and at the same position.

3. Craftsmanship

In handmade shoes, the craftsmanship is individualistic. The positions of the patches, nails and stitches and inter-distances are always different in different shoes.

It is not possible to produce two soles exactly alike. It is not possible to put stitches or nails in exactly the same positions even in a factory. In addition, sole materials will have some differences due to imperfect stamping and damage caused in the processes.

Thus, factory-made shoes also have individualities. However, the differences are sometimes so subtle (minute) that they are not registered or recorded in the marks, and thus, defy identification when the footwear etc. is new.

Fig. 6.15

Fig. 6.16

Stitch and nail patterns may alone individualise the sole of shoe (Fig. 6.16) and identify its prints (Fig 6.15) from the scene.

4. Damage

The damage to a shoe, like cuts and cracks or chipping the off portion of the sole (eaten by insects or lost due to chipping), also confers individuality on the sole.

5. Extraneous Traces

The extraneous matter like small stone pieces, glass chips, metal fragments, a nail, mud, paint or even cow-dung may be adhering to the sole, which may have come from the crime scene or the routes. If it leaves its corresponding outline in the mark of the shoe, it makes the identification easier and certain.

You have come up from the South West. Yes, from Horsham. That clay and chalk mixture which I see upon your toe caps in quite distinctive.

Sherlock Holmes-1891 (The Five Oranges)

6.7.3 Hoof Marks

The individualisation of hoof marks is difficult. Often the nature of the animal alone can be given. Sometimes damage to the hoof or wear and tear of the iron-shoes of a shod animal may permit individual identification of the animal.

6.7.4 Paw Marks

The paw marks sometimes contain crease and crack marks. They permit positive identification if the animal or its specimen marks are available.

The nature of the marks may indicate the type of beast.

6.7.5 Tyre Marks

It is often possible to give the possible make and model of a tyre mark from the pattern but positive identification needs, in addition to corresponding patterns, additional evidence of the type:

1. wear and tear;
2. damage;
3. presence of sticking foreign matter; and
4. repairs, if any.

Imitation of patterns in retreading prevents definite identification of the make/model of the tyres from tread patterns.

6.7.6 Gait Pattern

Gait pattern is walking (body movement) pattern of an individual. Its identifying features as already seen are the direction line, the walk line, the foot line, the foot angle, the step angle, the step length, and the step width. These and some other features of the foot or footwear link the walker with the gait pattern.

The gait pattern also indicates whether a person was walking, running or standing.

A running man exerts about two to three times the pressure he exerts while walking. Therefore, the shapes and sizes of the marks and the step lengths vary. The step length in a

slow walk is about 60 centimetres, while it increases to about 90 centimetres in running. It also varies from man to man according to his height and habits.

A standing man gives clear mark of his foot or footwear. There are drag or slippage marks if he is walking or running. If an individual has stood for sometime at a particular place, the marks at the spot are found somewhat mutilated.

Gait pattern studies have acquired tremendous importance in recent years; because they are used in Forensic Biometric identifications of the criminal through CCTV camera footage. These surveillance cameras cover the important sites or likely places for the depredation/visits of the criminals. They record the movement/action of the criminals. The criminals usually cover their faces and thus prevent their identification from the facial features. However, they do not bother about their gait pattern. In some countries, CCTV recorded gait pattern is used to identify the criminal. In India, we have yet to pick up gait pattern technology. Many surveillance cameras have been set in many places. They record the gait pattern images but the record is not studied/compared with the gait patterns of the suspects.

The sensors in computer extract/compare the data/sequence of the patterns from the images taken by the surveillance cameras.

> **"Great Juno, comes; I know her by her gait."**
>
> **Shakespeare: The Tempest**

6.8 IDENTIFICATION TECHNIQUES

Questioned track marks are identified by comparing them with the standard marks, obtained from the suspected sources. The methods of comparisons are:

6.8.1 Measurements

The dimensions of the questioned mark and that of the source or its specimen are compared. The inter-distances between characteristic points are noted and compared. Comparison is facilitated by the use of a divider of a large size.

6.8.2 Side by Side Comparison

The comparison of the positions and dimensions of identifying features is sometimes carried out with the help of photographs. Slightly reduced photographs (reduced to the same scale) are pasted side by side and a large glass or plastic sheet ruled into small squares is placed over the photographs. The identity or non-identity of the common source becomes apparent at once.

The changeover from three-dimensional evidence (footwear and impressions on moulds) to two-dimensional evidence (photographs) always incurs some loss of clarity.

6.8.3 Photographic Superimposition

A normal print of the crime exhibit and transparency of the corresponding text exhibit are prepared either to the original size or reduced or enlarged to the same scale. The transparency is superimposed over the photograph. The identity or non-identity of the common source is quickly established.

6.8.4 Adhesive Tape Superimposition

In this technique, the footwear is evenly smeared with fingerprint powder. Aluminium powder is preferable. Excess powder is tapped off. The footwear is placed on an adhesive tape of sufficient dimensions, capable to record the complete mark. The print thus obtained is covered with a plastic sheet. By placing it over the questioned mark, identity or non-identity of the suspected source is established and demonstrated easily.

It obviates the necessity of preparing photographs for court purposes.

The technique is not being used to any appreciable extent so far. However, it may become popular because it is convenient and superior to other techniques.

6.8.5 Composite Match

If the pattern is sufficiently characteristic, a composite match may be useful for demonstration purposes. A composite photograph is prepared in the usual way.

6.8.6 Pressure Pattern Evaluation

The foot surface is uneven. Its various parts, consequently, exert varied pressure on the surface with which it comes in contact. The different pressures create varied wear marks on the shoe materials, which get sandwiched in between the foot and the surface on which the foot is placed.

The pressure variations create contours. These contours are specific to the pressure patterns. It has been possible to capture these patterns through special equipment known as Pdbarograph (PBG). Two types of machines, one for static and one for the dynamic track marks have been developed. The preliminary investigations show encouraging results.

The footwear is worn for a considerable time also marks the insoles and the inside of the uppers. These marks have specific shape and dimensions depending upon the foot and the walking habits/peculiarities of the walker. They help to identify the footwear and the wearer.

6.8.7 Skid Marks[16]

When brakes are applied suddenly to stop a speeding vehicle skid marks are formed at the site. The brakes stop the revolution of the tyres, but due to inertia, the vehicle continues to 'skid' on the road until the friction overcomes the momentum. The distance of the drag or skidding is the length of the skid mark.

The length of the skid marks depends upon:

1. the speed of the vehicle,
2. total weight of the vehicle,
3. the condition of its tyres,
4. nature of the road surface, and
5. atmospheric conditions: rain/wetness reduce the friction. It increases the skid length.

Skid marks are often observed in motor vehicle accidents. The marks give an idea about the type of vehicle involved and its speed in hit and run cases.

The speed of the involved vehicles is calculated from the lengths of skid marks.

The absence of skid marks in an accident indicates either failure of the brakes or failure of the driver (drunk or drowsy).

16. Skid marks have been discussed in some details in chapter 16 on Motor Vehicles.

6.9 PRESENTATION

The track evidence is presented in the form of a report. The report is acceptable under section 293 of the Code of Criminal Procedure. An acceptable report contains detailed reasons in support of the opinion. It is illustrated, whenever necessary.

The track evidence is illustrated through photographs of the test exhibits (specimen prints, casts or original objects) and of the crime exhibits (casts or lifted prints). The photographs are pasted side by side on a chart. Prominent characteristic features used for the identification of the marks are shown by drawing lines and giving corresponding numbers in the two photographs. Notes on the margin explain the points of similarities. The expert signs the chart.

If the expert gives evidence in person, He produces illustration charts along with the report. The chart illustrates the points of similarities for the convenience of the court. His bases for identification are the direct examination/comparison and study of the various features on the crime and test exhibits.

It is convenient to produce photographs of about two-third of the actual size. Reduction in size increases the clarity of the points, in many a case.

If only a portion of the evidence is to be illustrated, enlarged photographs are produced/ presented.

Our experience indicates that the photographs in track evidence are always inferior to the original three-dimensional evidence. The photographs, though taken under ideal conditions, will miss some minutiae. It is, therefore, advisable to study the three-dimensional evidence, when photographs are not fully convincing. It consumes more time and requires handling of dirty exhibits, but such considerations are immaterial in cases where lives and liberties of persons are involved.

The use of adhesive tape prints in the courts should have excellent demonstrative value. The superimposition of the print over the cast should convince most of the viewers.

6.10 ACCEPTABILITY

6.10.1 Law and the Science

Formerly it was argued whether the track marks identification is a science and whether it is covered under section 45 of the Indian Evidence Act or not. The High Courts held different views on the subject and caused confusion. A ruling of the Supreme Court says that it is a science and is covered by section 45 of the Indian Evidence Act, has finally settled the issue.

6.10.2 Law and the Specimens

The second legal conflict was whether the police or the magistracy could order the taking of footmarks under Identification of Prisoners or not. Some courts held that it is against article 20(3) of the Constitution. The **Supreme Court verdict**[17] finally decided the matter that the taking of specimen footmarks is lawful.

6.10.3 Recognition of the Expertise

The track marks are one of the most frequently occurring evidence, though not utilised frequently. Unfortunately, Indian courts have not been given proper recognition to the track evidence. The Supreme Court has dubbed the science rudimentary. As the lower court has to

17. *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).

follow the verdict, the lower courts do not place much reliance upon the evidence. In fact, some of the lower courts refuse to consider it at all. Thus, an important forensic identification aid to identify/link the criminal is lost. The criminal justice system suffers.

The misunderstanding about the track evidence is due to a number of causes. It is hoped that reappraisal of the evidence would give it its due place.

The causes, which perhaps weighed against the evidence, are:

1. The footprint evidence is considered *at par* with tracking. The courts compare the evidence of a tracker and a footprint expert *inter se*. The two often do not come to the same conclusions. The courts conclude that the science is yet rudimentary.

   The courts fail to appreciate that the basis of the identification of the two experts are different. Whereas the tracker depends upon various elements of gait pattern, the other depends upon the individualizing features of the single mark. The latter may or may not carry sufficient evidence for definite identification.

2. The foot carries papillary ridges. The courts feel that like fingerprints, the identification of the footprints should be based upon papillary ridge details. Yet the identification is not based upon them in footprint identifications, contrary to their expectations! They, therefore, conclude that the science is yet in the developing stage.

   The earth, sand, mud and surfaces on which the marks are left are uncongenial to register the fine ridge details. They register only gross outlines which the expert observes/evaluates. He makes definite identifications only if he finds some deformity, crease marks, pits, cracks or wound marks. But these features are not found in all cases.

   The argument is carried further, of course, erroneously. It is felt that if the footmarks are not identified positively (where ridge patterns are expected) the footwear marks should have even lesser chances of identification, as they do not carry any ridge details.

   The basis of the misconception is the comparison of footmark with fingerprints on one hand and comparison of footmarks with footwear marks on the other hand. The comparison of footwear and other tread evidence should be, in fact, with tool marks and firearm identification work.

   The identification of a footwear mark in respect of its source is as certain as the identification of a fingerprint or fired cartridge or bullet provided the collected mark is clear and carries sufficient details.

   The wearer of a pair of shoes is not identified from these marks. If a second person puts on the footwear and creates a mark, the new mark will not be materially/forensically different from the first mark. It is like firearm evidence where the firearm is identified from the fired bullet or cartridge and not the person who fired the shot. Possession of the footwear at the material time, therefore, must be established, as in the case of firearms.

3. The track marks are, ordinarily, found in earth, sand, clay and mud. The surface may have stone pieces, twigs, grass and other matter on the surface. The extraneous matter obstructs the registering of the marks.

   - *First*, it covers the mark-bearing surface partly.
   - *Second*, the extraneous matter leaves its own imprint in the mark. These omissions and additions often confuse the nonprofessional.

4. The recording processes (lifting, casting, sketching or photography) are never perfect. Some loss of details the features always occur. It confuses the non-professional.

EVIDENCE CHART

Laboratory Requirements:

1. Unmutilated and uncontaminated clues
2. Adequate samples: shoes and tyres, footmarks, hoof marks, trace materials
3. Visit to the scene of occurrence
4. Photogrammetric or 3-dimensional photographs, accurate sketches, intelligible descriptions.

Evidence	Location	Collection	Identification	Sample	Possibilities
1	2	3	4	5	6
Latent prints of foot and footwear	Polished floors, furniture, carpets, bed-sheets, table-cloth, window-sills roofs, garages, bathrooms, lawns	1. Photograph, (with oblique lighting) 2. Lift with adhesive tape, bromide paper 3. Take electrostatic prints (from hard smooth surfaces) 4. Take holograms (from carpets, grass)	1. Introduce identification data (FIR data, initials) through chit on photographs 2. Record location by photography, sketches and description	Footprints or foot wear of the suspect, Tyres of the suspected vehicles	1. Linkage 2. Description of the suspect 3. Make of the footwear 4. Mode of walking 5. Possible make of the tyres
Visible prints of naked foot, footwears, tyres, hoofs, paws	1. Scene: floors furniture, roads, hard surfaces, window sills, roofs, garages, bathrooms 2. Entrance, exit, route, conference site, disposal site, etc.	1. Photograph 2. Lift	1. Introduce identification data (FIR data, initials) through chit on photograph 2. Record location by photography, sketches and description	Footprints or footwear of the suspected source	1. Linkage 2. Description of the suspect 3. Make of the footwear 4. Mode of walking

Evidence	Location	Collection	Identification	Sample	Possibilities
1	2	3	4	5	6
Impressions of naked foot, foot wear, tyres, hoofs, paws	Gardens, fields, roads, beds and shores of pools, rivers, lakes, seas, dung heap, dust heap	1. Photograph 2. Cast	1. Put identification data chit in the photograph 2. Scratch identification marks on the back of the cast	1. Original footwear or tyres 2. Prints of feet, hoofs, paws, similarly prepared	1. Linkage 2. Description of the suspect 3. Make of the footwear 4. Mode of walking
Latent prints of tyres	Garages, parking places, paper or plastic sheet on which the tyre rested	1. Photograph with ultra-violet rays 2. Intensification by polyvinyl acetate solution: spray, if necessary	Identification data chit in the photograph	The suspected tyres	1. Make and model of tyres 2. Identification of tyres 3. Identification of vehicle through tread and traces of tyres
Skid marks	Roads	1. Photograph 2. Measure 3. Sketch 4. Collect tyre traces	1. Put data chit in the photograph 2. Write identification data on the sketch paper	1. Get similar skid data, photograph under controlled conditions from the same vehicle at the same site	1. Speed of the vehicle 2. Identification of the vehicle through tread and traces 3. Reconstruction
Gait patterns	Scene: floor, carpets, lawns, garden, field, routes, hiding places	1. Photograph 2. Take photogrammetric photographs 3. Lift	1. Put data chit in photograph 2. Scratch data on lifts	1. Get gait pattern from suspect 2. Collect clear foot marks or footwear	1. Identification of source, sex, age, deformity, mental state, individuality, etc.

Evidence	Location	Collection	Identification	Sample	Possibilities
1	2	3	4	5	6
					2. Gait: running, walking, standing 3. Number of persons 4. Reconstruction: movement, halt, haulage etc.
Footwear	1. Scene 2. Routes 3. Disposal site 4. House or hide-out of the suspect	1. Photograph the location with data chit 2. Collect lose clues, stains 3. Scratch identi-fication data 4. Get signatures of witnesses 5. Seal and send it to laboratory from the site of recovery	1. Scratch identification data, initial 2. Get signatures of recovery witnesses	1. Second fellow of the pair 2. Similarly worn similar footwear of the suspect 3. Prints of the naked feet of the suspected wearer	1. Identification of fellow of shoe 2. Identification of the wearer 3. Reconstruction 4. Identification of marks 5. Identification of a mutilated corpse
Tyres	Vehicles, disposal site, scene	1. Record the position of the tyres (sketch, photograph writing) 2. Protect the evi-dence-bearing site 3. Pack, seal, despatch (from the scene)	1. Scratch identi-fication data 2. Get signatures of recovery witnesses	1. Tyre patterns 2. Manufacturer's catalogue 3. Corresponding tyre samples	1. Identification of make, model, crime scene marks, fluorescent traces, vehicle 2. Skid marks evaluations 3. Reconstructions

6.11 ADDITIONAL READING

1. Sharma, BR, *Footprints, Tracks & Trails,* CLA, Allahabad.
2. Bodziak, WJ, *Footwear Impression Evidence,* CRC Press, London, 2000.

6.12 CASE LAW

6.12.1 Footprint evidence Admissible[18]

Both the courts below believed the testimony of P.W. 3, as they could find no cogent reason for discrediting it, which was described as disinterested. The High Court relied on:

1. Motive of the accused persons to commit the crime;
2. The accused having been seen along with a stranger on Thursday, the 6th Agrahavan 1369. B.S. by Kazi Noor Mohammad (P.W. 3) while coming out of Batu's house with bloodstained clothes and a cycle which was being dragged by Majnu Mia as its rear wheel was chained and locked;
3. The embarrassment of the accused on being seen by P.W. 3 and the false explanation given by them about the existence of bloodstains on their clothes;
4. The fact that the cycle was taken by Maddassar on the day of the occurrence at about 4 p.m. to the cycle repairer, Bijoy Chakravarti whose shop is close to Majnu's house and that lock of the cycle was got broken at that shop;
5. Recovery of the broken lock from Bijoy's shop pursuant to the information given by Maddassar;
6. The recovery of the cycle from Maddassar;
7. False explanation by Maddassar that the cycle had been given to him by Batu's mother;
8. The existence of stains of human blood on the howai shirt worn by Maddassar at the time when P.W. 3 saw him on the day of the alleged murder;
9. The presence of blood marks on Majnu's nail cuttings;
10. *The opinion of the footprint expert (P.W. 22B. Chakravarti attached to the Forensic Science Laboratory) that some of the footprints found near the dead body resembled those of Maddassar;*
11. The fact that in the afternoon of 6th Agrahayan 1369 B.S. after the accused had come out of Batu's house that house was found locked and on the lock being broken open after three days the dead body was found lying in decomposed condition.

For holding that the circumstantial evidence led to no other conclusion except that of the guilt of the accused.

6.12.2 Non-acceptability of Evidence[19]

1. The learned session's judge relied principally for the corroboration of P.W. 10's evidence on the evidence of P.W. 33, the footprint expert. In para 38 of his judgment, the learned judge stated:

18. *Golam Majibuddin v State of West Bengal*, 1972 Cr LJ 1342 (SC). See also *Bahal Singh v State of Haryana*, AIR 1976 SC 2032 : (1976) 3 SCC 564 : 1976 Cr LJ 1568.
19. *Re Paramban Mammadu*, 1951 Cr LJ 580 (Mad).

> ***So far as accused 1, 3 and 5 are concerned, their complicity is established, because their footprints were found at the scene.***

That is to say, assuming the guilt of accused 1, 3 and 5 because their footprints were found in the bungalow, accused 4, must have been guilty, too, because he was associated with men whose footprints had been proved to be that of the murderers.

> *The opinion of a footprint expert is not admissible, as evidence. If the court is to make any use at all of footprints, it must be satisfied from a comparison of the various footprints that they are those of the persons whom the expert says they are. The value of evidence with regard to footprints is obviously very much less trustworthy than evidence with regard to fingerprints.*

In a fairly good impression of a finger or even in an impression where only a portion of the finger is shown, there is wealth of detail available to the expert and to the court for comparison. One sees in a fingerprint number of ridges and sweat pores situated along them. In examining a fingerprint, therefore, one not merely compares the general configuration of the finger and all the lines on it, but one is able to study such minute details as the bifurcations and junctions of the ridges and the relative positions on those ridges of the sweat pores. With regard to footprints, on the other hand, it would seem from the evidence and from what we have been able to read from Dr. Hans Gross, book on Criminal Investigation that one can only compare with the general shape of footprints found with the shape of impressions taken from the feet of the persons suspected. Even in this limited comparison, one has not the same certainty as one would have in comparing fingerprints found as the shape of impressions vary considerably according to the circumstances under which they are made. Footprints made when a person is walking slowly or fast or running slowly or fast or jumping, all create differences, which are material. Moreover, a footprint taken after a person has walked a considerable distance, as was the case here when the murder was committed, is larger than a footprint taken when a person has been at rest, as was the case when footprints were taken from the various persons in the sub jail, including some of the accused and P.W. 10 at page 497 of John Adam's translation of the above book, the learned author says:

> ***One may then say with Massen and rightly, that the details of all the impressions of a bare foot are in each particular case so distinctive and so characteristic that it is always possible to differentiate them, one from another and recognise again the same impression. This is wholly true only when the impressions in question have been produced under identical conditions...***

He then goes on to say that the difficulty increases if the foot is turned or moved. At page 499 he points out the necessity for making a number of trials in order to ascertain the circumstances under which an impression was made. At page 510, the learned author says:

> *Another result flowing from these conclusions is that the deductions made are only relative; they can never be expressed by precited data and have only comparative value. It is impossible to give measurements of fixed sizes; for the numerous factors—the size, the weight, and the other corporal singularities of the individual walking, his burden, his gait and the variable nature of the soil differ in every case and may be combined in so many diverse ways that it is absolutely impossible to give precise indications on this matter.*

After discussing the matter further the author says, "If one has but one indistinct footprint and no clue there from, another must be searched for." The only other passage that need be set out is found at page 532:

> *Much prudence must here be exercised (in taking measurements) and nothing undertaken which shows no chance of success. On the one hand the foot itself varies considerably,* e.g., *it is much smaller in cold weather or after a long rest than during hot weather or after a long march; on the other hand it is difficult to measure in as much as it is not a regular body and must be measured differently according to the parts dealt with.*

If we bear all these facts in mind, then we are far from satisfied that the prosecution has proved that the foot impression seen by the police on M.Os. 17 and 18 and on the portico are the foot impressions of accused 1, 3 and 5.

6.12.3 Expert Testimony Value[20]

The learned judge dealt with the testimony of the expert, at some length. His conclusion was that the evidence of the expert came to nothing. He did not direct the jury on the legal value of the testimony of the footprints expert. Section 45, Indian Evidence Act, does not include footprints within its ambit as it does the finger impressions. Notwithstanding this omission, the evidence of footprint expert has been admitted with the qualification that there should be other evidence to bring home the charge to the accused. The rule on the point is that the opinion of the footprint expert would not by itself suffice to base a conviction on and the rule has been applied to testimony of other experts including experts on fingerprints.

Considering that footprints as such are not included in section 45, Indian Evidence Act, it is expedient that the comparison of the footprints may be made so that the judge and the jury could see for themselves to what extent the footprints in question coincide. The summing up of the learned judge does not embody any observations on the value of the testimony of a footprint expert, in law.

The appeal is, therefore, allowed and the conviction and the verdict of the jury are set aside. The case shall go back to the Court of the Sessions for retrial.

6.12.4 Admissibility[21]

> *We are unable to accept this contention. The science of identification of foot-prints is no doubt a rudimentary science and not much reliance can be placed on the result of such identification. The track evidence, however, can be relied upon as a circumstance which, along with other circumstances, would point to the identity of the culprit though by itself it would not be enough to carry conviction in the minds of the court.*

The shoes had been recovered in the search of the house of the accused and the result of the search was proved by calling the search witnesses whose evidence was believed by both the courts with the result that these shoes, having been recovered from his house, the ownership of the shoes was *prima facie* established to be his even though the accused had alleged that he has not been staying in the house but had rented the house for some acquaintance of his.

There was evidence to show that he and his wife were staying there right up to 10 A. M. on June 9, 1953 on which day the search was made and if this evidence was believed it would go to establish his ownership of the shoes. If he was the owner of these shoes it was quite legitimate to compare the impressions made by these shoes with the mould prepared from the footprints on the spot.

The learned additional sessions judge, however, in order to derive further assurance attempted, in the examination of the accused under section 342, Code of Criminal Procedure to see if these shoes which had been recovered from the house of the accused fitted his feet. If the accused has refused to accede to this suggestion of the learned additional sessions judge he would have been justified in doing so and there is no provision in law by which this demonstration could have been made.

The accused, however, agreed to do so and on the shoes being tried on his feet. It appeared that they fitted his feet. Realizing however, that the result of this demonstration would be adverse to his defence he complained that the shoes were too tight for his feet.

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20. *Ganesh Gogoi v State of Assam,* AIR 1955 Assam 51 : 1955 Cr LJ 437.
21. *Pritam Singh v State of Punjab,* AIR 1956 SC 415 : 1956 Cr LJ 805 (SC).

The learned additional sessions judge, however, thought otherwise and recorded his impressions accordingly. This type of evidence was very strongly criticised by the learned counsel for the appellant as real evidence which was not justified at all by the provisions of section 539 B, Code of Criminal Procedure or otherwise and it was urged that it was a matter which prejudiced the defence of the accused.

> *The learned additional sessions judge was certainly not entitled to allow his view or observations to take the place of evidence because such view or observation of his could not be tested by cross-examination and the accused would certainly not be in a position to furnish any explanation in regard to the same.*

The whole thing appears to have been done with the consent of the accused and the only criticism which could be legitimately levelled was against the observation recorded by the learned additional sessions judge that:

> *to all appearances they quite fitted the feet of the accused even though he complained that the shoes were too tight for his feet.*

This observation could not carry the matter any further for the prosecution and the only fact which could be relied upon by the prosecution was that the shoes apparently fitted the feet of the accused and the learned additional sessions judge and the assessors were entitled only to take into account the fact that the shoes apparently fitted the feet of the accused though he complained that they were too tight for his feet.

This was ocular demonstration and the result of such ocular demonstration could certainly be taken into account by the learned additional sessions judge and the assessors and they were entitled to come to their own conclusions taking into account the further fact that the accused did complain at the time that the shoes were too tight for his feet.

The evidence of the trackers and also the fact that shoes were found in the house of the accused and the impressions made thereby tallied with the moulds prepared from the footprints on the spot were even otherwise enough to establish the identity of the footprints and point to Pritam Singh Fatehpuri as one of the culprits.

The case of Pritam Singh Lohara in regard to the track evidence was no different. In spite of the fact that none of the witnesses of the occurrence nor Pritam Singh, the driver, had stated anywhere before that Pritam Singh Lohara had a limp in his gait, the result of the evidence of the trackers was sufficient to establish that one of the culprits made footprints which showed that his way of walking was outwards and he put his right foot more outwards than the left.

This was quite characteristic of Pritam Singh Lohara by reason of the limp in his gait and this was further demonstrated by the impressions which he made when he walked in the district jail with the shoes given to him there on the sandy patch which was specially prepared for the purpose.

> ***This evidence in regard to Pritam Singh Lohara also was believed by both the courts below as sufficient to establish his identity as one of the culprits and we are not prepared to differ from their appreciation of the evidence. The track evidence, therefore, was a circumstance which was available to the prosecution against Pritam Singh Fatehpuri and Pritam Singh Lohara.***

6.12.5 Track mark Identification Admissible[22]

> ***We examined and compared the footprints for ourselves and in our opinion, there is such a remarkable similarity between the admitted footprints of the accused-appellant, Surajpal Singh and the footprints in blood found on the spot that there is a high degree of probability that the footprints in blood found on the floor of the verandah of the***

22. *Surajpal Singh v State of Madhya Pradesh,* 1972 MPWR 394 : 1972 MPLJ 1029 : 1972 Cr LJ 1668 (MP).

accused-appellant, Surajpal Singh are the footprints of the accused-appellant Surajpal Singh.

In *Pritam Singh v State of Punjab,*[23] Bhagwati J., speaking for the court said:

> *The science of identification of footprints is no doubt a rudimentary science and not much reliance can be placed on the result of such identification. The track evidence, however, can be relied upon as a circumstance which, along with other circumstances, would point to the identity of the culprit, though by itself it would not be enough to carry conviction in the minds of the court.*

It was, however, unfortunate that it was not brought to the notice of the court that the identification of persons from footprints has many facets and all these facets could not be clubbed together and science of identification from footprints be dubbed as rudimentary science.

The identification of persons from footprints may broadly be classified as under:

1. Identification from footprints when the footprints show ridge characteristics. In such cases, the science is as accurate as the science of fingerprints. The prints of the foot of a person show ridge characteristics of his fingers and may be used in a similar way for the identification of persons from similarity of ridge characteristics.
2. Identification from footprints which have special characteristics apart from ridge, etc. Some feet have special characteristics such as a scar at a particular place, an extra or missing toe, a deformative peculiarity, etc. In this case, the value of identification is proportional to the number of peculiarities.
3. Identification of footprints which show neither ridge characteristics nor other special peculiarities. This is what we usually understand by identification from footprints though quite erroneously, because it is only one of the three categories of identification from footprints. This is based on what is known as 'Gayer System' as propounded by G.W. Gayer, I. P., in his book 'Foot Prints', An Aid to the Detection of Crime for the Police and Magistracy, (1909 First Edition). In this system which is based on the system of the '*Khojis*', who were professional trackers of Rajputana, a foot has 12 features namely the five toes called *Anguta*, *Dusri*, *Tesri*, *Chouthi* and *Chichi*, the head line of the ball of the foot called *Zanjiri*, the ball of the foot called Pab, the instep called Talli, the length of the foot from uppermost point of Anguta to the lower most of the heel (Eri) called Chab, the heel called, Eri, the inner margin of the foot called, Bari Assi and the outer margin of the foot called Choti Assi. According to the author every one of the these twelve features has as much characters as the features of a face. Once a pupil learns to distinguish them at a glance, he is able to recognise a person from his foot impressions as easily as he can from his face. These features and their characteristics are compared with reference to three guidelines; the first is a vertical line going from the highest point of the big toe (Anguta) to the centre of the heel (Eri), the second line is at right angle to the aforesaid line running under the base of the little toe (Chichi) and the third joins the highest point of the big toe to the top of the little toe and joins the second line. The author further says at page 3:

   > *It is obvious that every individual's footprint must have a distinct individuality for even if there were only three common types of each of the features; and we had nothing else to go on, the total possible number of different types would be 531441, so that, on the average, two feet in about every million would be similar. A careful study of the illustrations and of the text will show that these figures do not err on the side of exaggeration.*

23. *Pritam Singh v State of Punjab,* AIR 1956 SC 415 : 1956 Cr LJ 805 (SC).

Again at page 6, paragraph 30, the author to avoid possibilities of error in identification says:

> *When two impressions are being compared with each other with the object of finding out if both have been made by the same foot one thing must be clearly understood, if they are impressions of the same foot they will agree in all essential points and there will be no points of disagreement. If there are points of disagreement and these have not obviously been caused by some peculiarity or irregularity of the ground, or by some accident, it should be at once admitted that the impressions are those of different feet.*

Rejecting the contention that the study of footprints is not a science in *Din Muhammad v Emperor,* Central Provinces Police Gazette, dated 27 May, 1914 pp. 125-130, the court of the Judicial Commissioner at Nagpur (H.J. Stanyon and H.F. Hallifax, A.J. Cs.) as far back as in 1914 held:

> *Now the knowledge of handwriting and that of finger impressions have been systematised and arranged under general truth and principles by many writers and pursued by many enquiries, and they are both sciences in which a great deal of progress has been made. The knowledge of footprints has similarly been systematised and pursued by trackers, mainly uncivilised and ignorant people in all other respects, all over the world, and also at the Saugar Police Training School under Mr. G.W. Gayer, who has arranged the knowledge he obtained from other seekers and from his own observations and experiments in a valuable monograph entitled 'Footprints'. The matter is, therefore, undoubtedly a science and the opinion of a person specially skilled in it is a relevant fact, under section 45 of the Evidence Act.*

In the instant case the points of similarities are 9 in respect of the right foot impressions, 10 in respect of the left foot impressions and the points of dissimilarities are three only in each case which have been explained by the expert (P.W. 13) is due to the different densities of the media in which the foot impressions were made namely, printer's ink and blood. The comparison has thus stood the test well and, under the circumstances these foot impressions in blood near the place of the incident which are proved to be those of the accused-appellant Surajpal Singh by preponderance of probabilities are a strong incriminating circumstance against the accused-appellant Surajpal Singh for which he has not accounted.[1]

6.12.6 Footwear Evidence — Police Padding[24]

The recovery of the pair of shoes of the deceased from the courtyard of the house of the accused also appears to be a case of police padding. After the accused persons had taken care to conceal the weapon of offence, the parts of the dead body, the clothes of the deceased, the photographs of the deceased with Mst. Asma Bi, the letters written by Mst. Asma Bi to the deceased, and had also taken great care to wash the floor of the house which they were occupying to remove all traces of bloodstains there is no earthly reason to suppose that they would have left the pair of shoes of the deceased in the courtyard of their house to enable the police to recover the same. Apart from this there is one more significant aspect which requires consideration. There is no evidence on the record to show that this pair of shoes was the only pair of shoes which the deceased had or that when he was last seen alive he was wearing that pair of shoes. In the absence of any evidence on the record to show that immediately before the deceased was seen alive he was wearing that particular pair of shoes no inference can be drawn against the accused from this recovery of the pair of shoes. After giving my careful consideration to this aspect of the matter, I find that the so-called recovery of shoes of the deceased does not advance the case of the prosecution at all. The recovery of the pair of shoes under the circumstances does not connect the accused with the crime.

24. *Mazahar Ali v State of Jammu and Kashmir*, 1976 Kash LJ 179 : 1976 Cr LJ 1629 (J&K).

6.12.7 Track Evidence as a Circumstance[25]

Learned counsel for the parties, however, in this court referred to a number of decisions of this court as well as of Allahabad High Court bearing on the question of the value of expert evidence on the matter of footprint. Learned counsel for the appellant has contended that the so-called science of detection of crime by means of footprints, alleged to have been left by a criminal at the scene of occurrence, is still too undeveloped to give any basis for forming any judicial opinion with regard to the guilt or otherwise of the accused persons.

Learned counsel for the State, however, has contended that the science has developed to such an extent that valuable clues to the presence of an accused can be derived from an examination of the footprint of a culprit left on the scene of occurrence or at relevant points while running away. The first question for consideration in this connection is whether there is any provision in the Indian Evidence Act to make footprint legally admissible. Section 45 has been referred to in this connection, which runs thus:

> *When the court has to form an opinion upon a point of foreign law, or of science or art, or to the identity of handwriting (or finger impressions), the opinions upon that point of persons specifically skilled in such foreign law, science or art, or in question as to the identity of handwriting (or finger impressions) are relevant facts.*

The section deals generally with what is called expert evidence. It has been contended on behalf of the appellant that section 45 in terms, refers to finger impressions only and not to footprints, and as such evidence based on the alleged footprint of the criminal compared with his genuine footprint should not be held to be admissible.

Reliance is placed in support of this contention on the case of *Oomayan (re),* AIR 1942 Mad 452 *Paramban Mammadu (re),* AIR 1951 Mad 737, *Ganesh Gogoi v State of Assam,* AIR 1955 Assam 51 and *Pritam Singh v State of Punjab,* AIR 1956 SC 415. The case reported in *K.K. Subbier v Lakshmana Iyer*, AIR 1942 Mad 452 : 43 Cr LJ 770 is a single judge decision of Horwill, J. where it has been laid down that experts in footprints are not recognised by the Evidence Act. There is no reference, however, made to any particular section of the Act. It was, however, further held in that case that:

> *A magistrate is entitled to take into consideration the evidence of a person, who has seen a footprint and taken the footprints of the accused and found that they are very similar. That evidence is not, however, sufficient to bring home the offence to the accused in the absence of further knowledge regarding the differences between one foot and another.*

In substance, therefore, it was held that such evidence could be looked into by a court of law although a person making such comparison could not be regarded as giving expert evidence as provided in section 45 of the Evidence Act. In the case of *Paramban Mamair madu (re),* AIR 1951 Mad 737*,* which is a Bench decision of that court, delivered by Horwill, J. *Supra)* the learned judge held that opinion of a footprint expert is not admissible as evidence.

The learned judge has, no doubt, referred in detail to the value of such evidence giving reasons why such weight should not be attached to such evidence. As regards the Indian Evidence Act, however, there is no reference to any particular provision of the Act nor any discussion of the legal position. In my opinion, therefore, this case cannot be looked upon as a considered authority on the applicability of section 45 of the Evidence Act to decide whether evidence of a footprint expert can be acted upon by a court of law as good evidence. In the case of *Ganesh Gogoi,* it was no doubt observed that the word 'footprint' does not occur in section 45 unlike the word 'fingerprint' so that footprint cannot be taken as included within the ambit of that section. The evidence of the witness having held the comparison of the

25. *Basudev Gir v State of Bihar,* AIR 1959 Pat. 534 : 1959 Cr LJ 1355 (Pat).

footprint was yet held to be admissible on the ground that the judge and jury could see for themselves as to what extent the footprints coincided. This case, thus, can be taken to have followed the rational in *Oomayam (re)*. In the case of *Pritam Singh v State of Punjab*, AIR 1956 SC 415 there is an observation to the effect that the science of identification by footprints is a rudimentary science and much reliance cannot be placed on the result of such identification.

The track evidence, however, can be relied upon as a circumstance which, along with other circumstances, would point to the identity of the culprit though by itself it would not be enough to carry conviction to the mind of the court. That decision also does not lay down that such evidence is not admissible under the provisions of the Indian Evidence Act. If anything, the observation would point to the conclusion that such evidence would not be inadmissible but that much reliance could not be placed on such evidence on account of the undeveloped stage of scientific knowledge in regard to footprint. Learned counsel for the State, however, has drawn our attention to the case of *Mannian Velayudhan,* which is a Bench decision of the Madras High Court consisting of Govinda Menon and Mack, JJ. printed in the Bihar Criminal Intelligence Gazette, dated 6th July, 1956, where there is an elaborate consideration of the applicability of section 45 of the Indian Evidence Act to the evidence given by an expert on the footprint under consideration in the criminal trial.

With respect, I agree with the observation of Govinda Menon, J. when his Lordship held the opinion of an expert in footprints admissible under the heading "science" occurring in section 45. Their Lordship in their judgment expressed their disagreement with the view adopted in the case of *Paramban Mammadu (re),* AIR 1942 Mad. 452 and the case of *Oomayam (re).*[3] In my opinion, the word "science" which has been defined in the Universal Dictionary of English language, referred to by the learned judge, as great proficiency, dexterity, skill based on long experience and practice, is sufficiently wide to include the evidence of an expert.

The learned judge has referred in that connection also to a book *Modern Criminal Investigation,* by Dr. Harry Soderman, Chief Director of the National Institute of Technical Police, Sweden, wherein he has referred to the fact that some maternity hospitals in America, where prints of the sole of new born babies are taken for identification purposes, it is considered to be a reliable test for identifying the child. I may also refer in this connection to the fact that section 45 of the Evidence Act, as it stood prior to its amendment by Act V of 1899, did not contain the words "finger impressions" evidently, because the Legislature thought that the section as it stood was comprehensive enough to cover the opinion of all experts in foreign law or science or Art.

There was, however, a decision of the Calcutta High Court in the case of *Queen Empress v Fakir Mohammad Sheikh,* 1 Cal WN 33 where it was held by Banerjee, J that the opinion of an expert as to the identity of thumb impression was not admissible under section 45 of the Evidence Act. It was with a view to obviate the conclusion of the learned judge in that case that the Legislature thought it fit to incorporate the words "finger impression" in specific terms. The reasons for the amendment quoted by Sarkar in his book on the *Law of Evidence in India* are relevant for the present purpose as well. The quotation runs thus:

> *The system of identification by means of such impressions is gaining ground and has been introduced with considerable success especially in the Lower Provinces of Bengal. It seems desirable that expert evidence in connection with it should be admitted, and with that object it is proposed by Clause 3 of this Bill, expressly to amend the law on the subject.*

In my opinion, that amendment indicates the policy of the Legislature regarding progress in science and accordingly, I agree with the opinion of Govinda Menon, J. that the word "Science" occurring in section 45 should be held to be comprehensive enough to include the opinion of the expert in footprints as well.

Learned counsel for the appellant has, however, contended that at least in the present case the evidence of the expert should be discarded as valueless, because there was no complete footprint, found on the gramophone record but only a partial footprint. Even the expert admitted in his evidence that no positive opinion of identity could be given by him since the full footprint impression was not available. The expert, however stated further:

> *There is no chance of the photo* A *being of any other person. The chance is very remote, we are very conservative in our opinion, and unless we get full data we do not give positive opinion. If certain features in one print agree with relative position in another print, then the remaining portion if appeared would also have agreed.*

In this particular case the prints of bridge and the heels were necessary for giving a positive opinion. Bridge and heels are missing in the photo marked *A*.

Giving reasons for his opinion, he said as follows:

> I compared the print marked 'A' with all the nine specimens of the nine suspects including the prints *X, X-1 and X-2.* Print marked A by me was found to be similar with the correlative right footprint portion of the suspect Basudeo Gossain marked *X, X-1 and X-2.* The common correlative peculiarities have been marked out by me on the photographs marked *A* and *X* by me. The reasons of my opinion are as follows:
>
> They are similar in physiognomy. The distribution of the toes is similar. The nature of the lines at central portions in the toes are similar, which are clear in *A* and very clear in *X.* The second toes and the third toes are close in both. The fourth toes and the fifth toes in both are apart. The *zanjiri* lines below the toes are similar in both, in their concavities and convexities. The ball portion below the toes and *zanjiri* lines so far available are similar in both. For superimposition check chart, I have traced *A* and *X* both on a sheet of glass and have superimposed the tracing of *A* and *X,* and of *X* and *A*, and they fall in their correlative position.

A look at the photograph of print *A*, however, shows that the second and third toes are joint which is not the case on the genuine footprint of the portion marked *X, X*-1 and *X*-2. The expert (P.W. 6), who came to the court to explain the position, stated to us that a slight difference was due to the medium. The two fingers (toes) appear to be joint because there might be an external medium such as mud or sweat sticking to the toes of the appellant. That matter, however, has not been explained in the evidence given by him in the court of the judicial commissioner.

In the circumstances, even if the evidence of the expert (P.W. 6) be left out of consideration, the evidence of P.W. 1 Ramkishun Ram would be sufficient to uphold the conviction of the appellant. This evidence, however, stands corroborated also by the fact that he admitted in his examination under section 342, Code of Criminal Procedure that he was made to give his footprint on a gramophone record by the investigating officer holding out a temptation that he would be let off if he agreed to do so. I have already held that this explanation is palpably false. It is obvious, therefore, that the court would be justified in holding that the footprint on the gramophone record was his and the circumstance could be put in weight against him.

In the result, it must be held that this appeal has no merit and it must be dismissed.

6.12.8 Improper Testimony[26]

Now I take up the evidence of the footprint expert. His evidence with regard to footprint is unreliable and inadequate. It would be hardly fair to dub him an expert in footprint because he has got no experience in this line. Prior to this case, twelve years ago he had occasion to examine

26. *Fakirchand v State of Madhya Bharat,* 1955 Cr LJ 1073 (MB).

footprints. He went to the spot and found that there were footprints in blood on the '*farsi*' (paved floor). He got the footprint on the '*farsi*' impressed on a plain glass, then traced them on a paper. Several people were made to walk on road filled with earth and from footprint, made on earth, he compared them with the footprints traced on paper and taken from the bloodstained '*farsi*' and he gave opinion that the footprints were of accused Fakirchand.

The expert has not given any scientific tests from which he came to the conclusion that the footprints of Fakirchand on earth tallied with the footprints made on bloodstained *'farsi'.* He has not kept the trace of Fakirchand's footprint impression on the earth on road so that a comparison can be made with the footprint trace taken from the *'farsi.* He does not say whether the pad and toe impression were similarly identical. In fact he assigns very inadequate and unsatisfactory reason for coming to the conclusion that the footprints on the *'farsi'* at the scene of occurrence are those of accused Fakirchand.

The learned judges below have simply accepted the opinion of the expert as gospel truth and they could not form their own independent opinion. In a murder case, before relying on the opinion of the expert as to footprints found near the corpse of the deceased as conclusive evidence against the accused, the judge should form his opinion with regard to the identity of the footprints found near the corpse with the footprints of the accused.

6.12.9 Probable Evidence[27]

The next branch of Mr. Ghosh's submission relates to footprints and the nature and effect of the evidence of the expert thereupon, P.W. 16. "The witness (P.W. 16), is the expert on footprints attached to the Forensic Science Laboratory, Medical College, Calcutta. On 16th August, 1966, he received amongst others one leather slipper of the left foot marked 'Y' by him and 4 specimen footprints marked 1 to 4. The slipper is exhibit 7 and the specimen footprints are exhibits VII to X. He stated that some comparable features could be deciphered from the slipper marked 'Y'. On comparison similarity in features was noticed between the slipper marked 'Y' with left foot specimen footprint marked '1' by him. He was ultimately of the opinion that in all probabilities marks 'Y' and '1' are production of the one and the same left foot. Mr. Ghosh has contended that the evidence of the footprint expert is not sufficient to connect the accused appellant with the crime. Upon an analysis of the said evidence we agree with Mr. Ghosh. It is passing really strange that an expert in his ultimate opinion would depend on probabilities and not on firm conviction in the absence whereof the said evidence would become dangerously thin indeed and the court of law would not take that by itself into consideration for the purpose of fixing the guilt of the accused. The expert having reached the point of interrogation or of probability, cannot be relied upon for the purpose of a conviction in a case under section 302, Indian Penal Code. It is difficult for us to comprehend as to how the expert was satisfied by comparing the specimen footprint of the accused, as taken, marked '1' with the slipper of left foot, marked 'Y'. It is also difficult to understand as to how marks 'Y' and '1' being photographed in superimposed manner in his presence and enlarged thereafter could be of any material help in connecting the accused with the crime.

Apart from the nature of the evidence of the expert as discussed above, the science of identification by footprint impression is still an imperfect science and it is inexpedient to place reliance on the result of such identification. Several authorities on the subject have been referred to before us, apart from the case law cited on the point, both by Mr. Prasun Chandra Ghosh and Mr. S. Banerjee, the learned D.L.R. In support of his contention Mr. Ghosh has referred to the observations of Charles E. O'Hara and James W. Osterburg made in their book

27. *Bhulakiram Koiri v State of West Bengal*, 1970 Cr LJ 403 : 73 Cal WN 467 : ILR (1969) 1 Cal 39.

'An Introduction to Criminalistics'. In the 4th printing (1960) of the said book the authors have observed at page 107 that:

> *It is not always a simple matter to identify the shoe of suspect as being unquestionably shoe that made the shoe impression at the scene of the crime. The large-scale manufacture for a few predominant brands of shoes give the defence counsel grounds of establishing a strong doubt concerning the unique correspondence between the cast of the impression and the defendant's shoe. In many cases, the sole of the cast is without characteristics except for the shape of shoe. The era of cheap shoes has led many people to the habit of purchasing new shoes rather than repairing old ones.*

By referring to the principles laid down therein about the walking pattern, Mr. Ghosh has submitted that the method as adopted in the present case, upon his own admission of P.W. 16, has not conformed to the norms enjoined in this behalf. Mr. Banerjee has referred to the book on *'Footprints'* by G.W. Gayer (Ist Edn. 1909). At page 6, the author has observed that:

> *When two impressions are being compared with each other with the object of finding out if both have been made by the same foot, one thing must be clearly understood, if they are impressions of the same foot they will agree in all essential points and there will be no points of disagreement.*

The difficulty in present case is regarding the two impressions as sought to be compared by the expert and there even the expert has only found 'some comparable features' and not an agreement in all essential points. Mr. Gayer has further observed at page 12 of the said book that:

> *It is useless to compare measurements of feet with measurements of impressions of feet left on the ground because the sole is very liable to spread when pressure is brought on it.*

We agree with the said observation and hold that the said difficulty obtains in the present case also. Mr. Banerjee referred in the next place to the treatise on *'Modern Criminal Investigation'* (5th Edn.), by Dr. Harry Soderman and John O'Connell. The learned authors have observed that:

> *From the view point of criminology, sole-prints are not as important as finger and palm prints, but occasionally they may have some measure of importance.*

Thereafter the authors have discussed the classification for this purpose as devised by Wilder and Wentword and by Dr. Emil Jerlov of the Maternity Hospital of Halsingburg, Sweden. As to the identification of footprints it has been further observed in the said book at page 166 that:

> *In order to get a true picture of the formation of the foot in different positions it is necessary to take four different footprints, namely, in normal standing position, in walking, in a standing position with pressure on the outer portion of the foot, and in a standing position with pressure exerted on the inner part of the foot.*

It, would, therefore, appear that the comparison as made in this case is defective and no fool-proof opinion can be advanced on the basis of the same. We may refer in this connection to the well-known treatise on *Criminal Investigation,* as adopted by J. Collyer Adam (1924 Edn.) from the *"System der kriminalistik"* of Dr. Hans Gross. The same is an authority on the subject and has been referred to by G.W. Gayer and also both by Dr. Harry Sodderman and John J.O'Connell and by Charles E. O'Hara and James W. Osterburg. As to the importance and use of footprints the learned author has observed at page 325 of the said book that:

> *As a rule footprints are but seldom found where they are wanted. Moreover, when they exist, they are rarely entire and complete, and for that reason are considered of no value..... On the other hand when well preserved traces do exist, the essential thing is to be able to interpret them and to know how to make good use of them. On this science is dumb and has hardly even approached the question.*

As to the reproduction of footprints, he has further observed at page 363 that:

> *We trust it is unnecessary at this stage to repeat that all important impressions must be reproduced. One can hardly imagine an investigating officer so indifferent or so inexperienced as to experiment with the original footprint itself. It is, however, a fact that such persons exist, so that we cannot too strongly point out the danger of damaging an impression.*

Unfortunately, however, the examination in this case of the foot impression suffers from the said defect and the method as adopted has been quite unsatisfactory and has resulted in a serious prejudice to the accused appellant.

In this connection reference has been made to several decisions on the point. Mr. Ghosh has referred to the decision in *Bhikha Gober v Emperor,* AIR 1943 Bom 458, by Chief Justice Beaumont and Mr. Justice Sen, Chief Justice Beaumont delivering the judgment held at page 460 that it is not sufficient:

> *that the foot-marks tallied with the accused's shoes. That may mean no more than that these marks were made by shoes of a size corresponding to the size of the accused's shoes. That is not enough. There may be a large number of shoes in village of the size of the accused's shoes. The evidence must go further and show that the marks had some peculiarity which was found in the shoes of the accused, and would not be found in most other shoes.*

The next case cited in that of *Re Paramban Mammadu,* AIR 1951 Mad 737 Mr. Justice Horwill and Mr. Justice Rajgopalan observed at p. 740 that:

> *The opinion of a footprint expert is not admissible as evidence ..... The value of evidence with regard to footprints is obviously very much less trustworthy than evidence with regard to fingerprints..... With regard to footprints, on the other hand it would seem from the evidence and from what we have been able to read from Dr. Hans Gross's book on Criminal Investigation that one can only compare with the general shape of footprints found with the shape of impressions taken from the feet of the person suspected.*

The next case cited by Mr. Ghosh is that of *Ganesh Gogoi v State of Assam,* AIR 1955 Assam 51, Chief Justice Sarjoo Parasad and Mr. Justice Ram Labhaya delivering the judgment observed at page 54 that:

> *Section 45, Evidence Act, does not include footprints within its ambit as it does the finger impressions. Notwithstanding this omission, the evidence of footprint expert has been admitted with the qualification that there should be other evidence to bring home the charge to the accused. The rule on the point is that the opinion of the footprint expert would not by itself suffice to base conviction on and the rule has been applied to testimony of other experts including experts on fingerprints.*

A reference was also made to the decision by Mr. Justice S.C. Misra and Mr. Justice U.N. Sinha in the case of *Basudeo Gir v State of Bihar,* AIR 1959 Pat 534, Mr. Justice Misra referred to the various authorities and decisions on the point and observed at page 586 that:

> *In my opinion, the word "science" which has been defined in the Universal Dictionary of English language, referred to by the learned judge, as great proficiency dexterity, skill based on long experience and practice, is sufficiently wide to include the evidence of an expert.*

Mr. Justice Sinha agreed with the said view and referred to the two previous decisions by the Patna High Court, namely, in the case of *State v Karu Gope,* AIR 1954 Pat 131, and in the case of *Ram Karan Mistri v State of Bihar,* AIR 1958 Pat LR 246, wherein the opinion of the expert was considered "on merit without any reference to section 45 of the Indian Evidence Act." It is quite true that in section 45 of the Indian Evidence Act there is no mention of footprint impression in specific terms. As a matter of fact the words "finger impression" were added by section 3 of the Indian Evidence Act (5 of 1899). In this context it would be pertinent to refer to the case of *Queen-Empress v Fakir Md. Sheikh,* (1979) 1 Cal WN 33 where Mr. Justice Banerjee held at page 35 that:

> though the comparison of thumb-impression is allowable, such comparison must be made by the court itself; and the opinion of the expert as to the similarity of such impression is not admissible under section 45 of the Indian Evidence Act.

It is also pertinent to consider that in Ceylon section 45 of the Indian Evidence Act has been amended to include the words "palm impression" wherever they occur in this section. Therefore, the state is not in a flux so far as Ceylon is concerned. However, as has been held in AIR 1959 Pat 534 such evidence by an expert on footprint could come within the ambit of the word "science", as used in section 45 of the Evidence Act. The utmost bounds of human thoughts are, however, ever expanding and the outer periphery of science are extending everyday. The expression "science" is accordingly acquiring a wider connotation in the world today. Identification of people by smell or even by their teeth are now in vogue and are considered to come within the ambit of "science". Forensic Odontology or the science of identifying people by their teeth was recently relied upon for the detection of crime in the High Court at Edinburgh. The cloud, however, has been lifted and the point settled in the case of *Pritam Singh v State of Punjab,* AIR 1954 Pat 131 decided by Mr. Justice Bhagwati, Mr. Justice Venkatarama Ayyar and Mr. Justice Sinha, Mr. Justice Bhagwati who delivered the judgment observed at page 423 that:

> *The science of identification of footprints is no doubt a rudimentary science and not much reliance can be placed on the result of such identification. The track evidence, however, can be relied upon as a circumstance which, along with other circumstances, would point to the identity of the culprit though by itself it would not be enough to carry conviction in the minds of the court.*

We hold, therefore, that it is unsafe to base a conviction on the basis of the expert's evidence alone regarding footprint or sole print. As considered in the light of the observations made by the various authorities on the subject and in view of the principles laid down in the different cases on the point, the science of footprint or sole print or of track evidence appears to be still in an embryonic stage. It may have travelled beyond the stage of crude empiricism but has not yet reached the stage of an exact science.

6.12.10 Footprint Evidence — No Data[28]

Next we come to the footprints stained with blood found in the courtyard. We find from the evidence of P.W. 19 that he found 5 footprints. He selected three out of those as fit for examination. Amulaya Chandra Sahu (P.W. 28) and Durvodhan Barik (P.W. 21) were directed by him to take photographs. Thereafter glass tracing was done by him. Specimen footprints of Basu and Kanhu were also taken. Only one footprint was found suitable and on comparison the specimen footprint of Kanhu resembled the footprints as reflected in Exts. 14, 15, 16 and 16/1. He proved the report Ext. 20. P.W. 19 stated:—

> *.....In the opinion Ext. 20 we are definite that the footprint marked 'A' as Exts. 14, 15, 16 and 16/1 has resemblance with the footprints in the document marked 'X'. In report Ext. 20 we said 'some resemblance' because the footprints in Exts. 14, 15, 16 and 16/1 were partial footprints which completely tallied with the corresponding part of the footprint reflected in the document marked 'X' for identification which is the full footprint of Kanhu Barik. True it is the reason assigned by me today in the foregoing lines do not find place in Ext. 20 because these details were not at all necessary. There was no ridges and therefore, the number of ridges taken into consideration does not arise.....*

28. *State of Orissa v Kanhu Charan Barik*, 1983 Cr LJ 133. Also see *Mangobinda Swain v State of Orissa*, 1978 Cr LJ 127 : 1977 Cut LR (Cri) 132; *Shankaria v State of Rajasthan*, AIR 1978 SC 1248 : (1978) 3 SCC 435 : 1978 Cr LJ 1251 (SC).

The reasons in support of the said opinion are lacking. The report is not conclusive proof. Evidence of experts after all is opinion evidence. The opinion is to be supported by reasons. The court has to evaluate the same like any other evidence. The reasons in support of the opinion, if convincing, make the opinion acceptable. There is no place for *ipse dixit* of the expert. It is for the court to judge whether the opinion has been correctly reached on the data available and for the reasons stated. We quote from the decision of the Supreme Court in *Murarilal v State of Madhya Pradesh*, AIR 1980 SC 531 : 1980 Cr LJ 396 (Para 4).

> *.....But the hazard in accepting the opinion of any expert, handwriting expert or any other kind of expert, is not because experts in general, are unreliable witnesses – the quality of credibility or incredibility being one which an expert shares with all other witnesses, but because all human judgment is fallible and an expert may go wrong because of some defect of observation, some error of premises or honest mistake of conclusion. The more developed and the more perfect a science the less the chance of an incorrect opinion and the converse if the science is less developed and imperfect. The science of identification of fingerprints has attained near perfection and the risk of an incorrect opinion is practically non-existent. On the other hand, the science of identification of handwriting is not nearly so perfect and the risk is, therefore, higher. An expert deposes and not decides. His duty is to furnish the judge with the necessary scientific criteria for testing the accuracy of his conclusion, so as to enable the judge to form his own independent judgment by the application of these criteria to the facts proved in evidence.*

Their Lordships further stated in para 11:—

> *.....Reasons for the opinion must be carefully proved and examined ..... In cases where the reasons for the opinion are convincing and there is no reliable evidence throwing a doubt, the uncorroborated testimony of a handwriting expert may be accepted .....*

Following the aforesaid dictum of the Supreme Court and agreeing with the counsel for the appellant, we exclude the evidence of footprints as in Exts. 14, 15, 16 and 16/1 and Ext. 20 and the evidence on this question as given through P.W. 19 from consideration, as having no probative value. It is worthwhile to note that the expert does not say that the specimen footprints were identical with the foot prints as per Exts. 14, 15, 16 and 16/1. On the contrary, in Ext. 20 he says that there was "some resemblance". He admits that there were no ridges and so, consideration of ridges did not arise.

'It was, however, unfortunate that it was not brought to the notice of the court that the identification of persons from footprints has many facets and that all these facets could not be clubbed together and science of identification from footprints be dubbed a rudimentary Science!

Naik, 1972 (MP HC)

CHAPTER 7

TOOL MARKS

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Fig. 7.1
Mechanical Fit + Corresponding Striations

7.1 NATURE

7.1.1 Definition

A tool mark is a print/impression punched/engraved/moulded mark on a surface. It may be due to an impact, abrasion, cut, scoring, insertion, engraving or grooving. The depth and clarity of the tool mark on the force and the angle at which the tool meets the object and the nature of the contacting surfaces. Simultaneously, it may exchange material traces with the surface of contact also. If the impacted surface is hard, it may also damage the tool and/or create its marks on the tool. The present study is mainly relating to tool marks Forensics and related phenomena.

A tool mark is a physical evidential clue, often found at the crime scene. If the mark is from a tool recovered from a suspect, the mark links the crime/crime scene with the tool and *inter alia* with the suspect/culprit.

7.1.2 Types of tool Marks

The tools leave two types of marks:

1. Class tool marks
2. Individual marks

Class tool marks are characteristic of the class of the tool to which the tool belongs. They indicate the type but do not identify the individual tool. Their main advantage is that they limit the tool to one class.

Individual marks are unique to the tool used. They permit definite linkage of the tool with the incriminating marks and consequently with the perpetrator of the crime.

The individuality of the tool is due to the manufacturing defects, accidental damage to the tool and wear/tear of the tool.

7.1.3 Classification

Tool marks classifications are based on:

1. The mode of creation, and
2. The nature of marks

The mode of creation gives the following categories:

7.1.3.1 Sliding or dynamic marks

When the tool makes sliding contact with the recipient surface, it creates striations/scratches on the surface. For example, when a bullet, of appropriate diameter, passes through a rifle barrel, the barrel creates striations on the bullet. These striations are used to link the rifle with the bullet. If this bullet happens to kill a person, the killer rifle (and hence its owner) are linked in a homicide case.

Here rifle acts as a tool.

7.1.3.2 Cut Marks

Cut marks are created by sharp-edged tools/weapons like swords, knives, sickles, axes, scissors, wire cutters, shears and pliers. They generally create striations, which are unique to the tool. They are found in all sorts of crimes, more frequently in theft cases and sometimes in murder cases also.

The tool may also carry traces from the cut object and kelp link the tool with the crime.

In a case of murder, the culprit acted clever. He sawed off his unlicensed gun to hide it on his person while taking it to the scene of offence. He murdered the person and then placed the gun in the victim's hand after wiping off his fingerprints from the gun, to simulate suicide. He left the scene un-noticed.

Later, the police arrived at the scene and thought it was a case of suicide. Then the investigator noticed that the barrel of the firearm was freshly cut. Where is cut piece of the cut barrel?

They searched the scene for the cut piece of the barrel and for the hacksaw. They could not find them. The fresh cut had created a strong suspicion that perhaps another person was involved in the shooting and he had shortened the barrel to make it easy to conceal the firearm on his person. The absence of the barrel piece and the hacksaw on the victim's premises strengthened their suspicion/belief.

The case was registered as murder and a search for the culprit was started. A hacksaw was found on the premises of one of the suspects, but no barrel end. The investigating officer found some sparkling particles lodged in the teeth of the hacksaw. They might link the hacksaw with the gun found at the scene of murder. Both the hacksaw and the gun were sent to the departmental Forensic laboratory.

Trace elemental profiling of the particles on the hacksaw and of the barrel metal were developed and compared. The profiles matched. The trace from the barrel on the hacksaw linked the culprit with the crime. (CH)

7.1.3.3 Impact/Static marks

A tool creates impact/static marks (also called indentations) when it comes in non-sliding contact with the object with some force. Normally, the impacting tool is of a harder material than the recipient surface. Hammer, punches, and dies are the obvious examples. However, staff/stick/stone/crowbars/hands/shoes and many other hard objects create impact marks. The marks (firing pin, breach face, chamber marks), on a fired cartridge from a firearm, are also impact/static marks, are facsimiles of the impacting surface, if fully printed.

7.1.3.4 Repetitive Action marks

The common examples of repetitive action marks are multiple hammering, sawing movement of the saw and marks from the boring drill. They often do not permit the identification of the creating tool. However, in some cases, when there is some defect(s) in the working edge of the tool, it may be possible to link the tool with the marks.

The nature of the marks/evidence classifies them as under:

1. Indentations/impact/munch marks
2. Scrapes
3. Saw marks
4. Drilled holes
5. Engrave marks
6. Contact marks
7. Prints (from printing blocks, numbering and dating machine)
8. Painted marks
9. Broken and severed Parts
10. Extraneous material (not a tool mark but associated evidence sometimes)

Strictly speaking, only the first five types are tool marks. Others (the last four) are entities connected with tool marks so intimately that it is perhaps better to discuss them along with tool marks.

7.1.3.5 Indentations/Impact Marks

An indentation is caused by a tool when it is pressed upon a surface without sliding motion, *i.e.,* by the static impact. The mark contains the outline of the tool surface with its irregularities, which comes in contact with the impacted surface. The transfer of marks is often partial. The clarity and individuality of the mark depends on the surface of the tool, the force of impact, and the nature of the recipient surface.

Fig. 7.2
Air rifle pellet mark on wind screen of a jeep allegedly fired by some culprit

The following tools leave indentations:

1. Hammers
2. Punches
3. Dies
4. Metallic seals and stamps
5. Stones, bricks and other articles used to cause impact
6. Maces

Sometimes, tools like knives, chisels, jimmies, crowbars, screwdrivers and axes also leave indentations.

It is often possible, in most cases, to connect a tool positively with an indentation left at the scene of occurrence, which decisively links the criminal with the crime.

7.1.3.6 Scrapes/Sliding Marks

Sliding contact of a tool with the recipient surface creates scrape marks. The surface is scratched in a characteristic fashion depending upon the irregularities (nicks and protrusions) of the scratching surface of the tool.

All types of tools create scrape marks (striations) in sliding contacts, prominently the following tools:

1. Cutting tools like swords, knives, axes, scythes, shears, wire cutters, hatchets, scissors.
2. Chisels, can-openers, crowbars, screw drivers.
3. Pliers and wrenches used to turn nuts, bolts and pipe fittings.
4. Shovels used to dig earth.
5. A moving vehicle is scratched when it slides along a protruded object like pieces of projected stones, bricks, metal or wood.
6. Marks on a bullet, scrape marks of protruding firing pin on the base of a cartridge.

Scraping scratches the surface and creates striations (lines). The width, depth, and inter-distances of the striations vary to a certain extent depending upon the angle of application, the force used and the relative hardness of the two surfaces.

Striation marks are encountered frequently in criminal investigations.

7.1.3.7 Saw Marks

Saw marks, including hacksaw marks, are repetitive action marks. They permit the identification of the tool only in rare cases. When the whole length is cut through, the saw or the hacksaw leaves its pattern of the cut surface. It indicates the number of teeth per unit length. Broken teeth, their number, position, and shape allows positive identification of the tool, in most of the cases, where they occur.

7.1.3.8 Drill Marks/Holes

Holes dug by drills and bits in wood rarely permit their linkage with the creating tool. If the hole is not through and through, the base (bottom) of the hole may carry the identifiable pattern of the end surface of the drill in the form of an indentation of the surface of the tool. The indentation may permit a positive linkage of the mark and the tool.

7.1.3.9 Punch Marks

Punch marks are quite common in human life. The identification data is punched on many objects (especially on metal objects). Outstanding examples include firearms, vehicles and ornaments. The punched marks are often identifiable in respect of the punch used to create the marks.

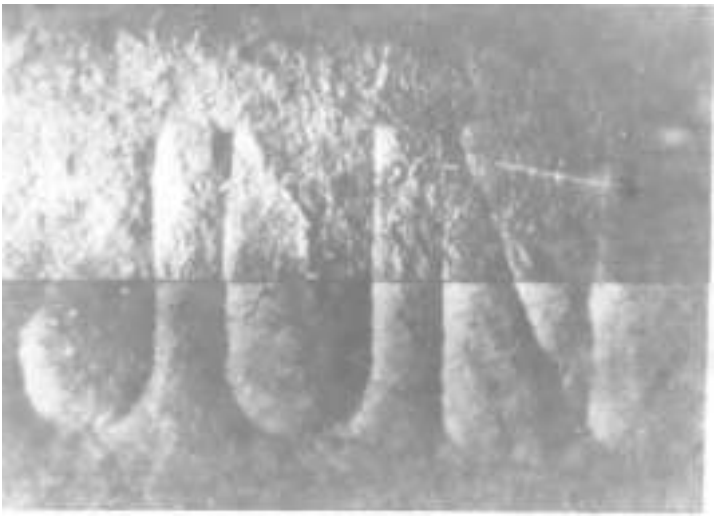

Fig. 7.3
Marks from the Same Punch

Fig. 7.4
Marks not from the Same Punch

7.1.3.10 Dies

Dies like punches, are used to stamp identification and other data on objects. The die used to create the mark is unique and therefore permit definite linkage of the die with its mark in most of the cases.

7.1.3.11 Engraved Marks

Engraving of identification and other marks or logos, the design is common on metal objects including on jewellery, small arms, decoration pieces, and machinery. When they are stolen, the thief often erases them to hide their identity.

Resuscitation of these obliterated marks to identify their identities and *inter alia*, that of their owners is an important task of Forensics.

There are two methods of engraving. In one, a manual engraver is used for softer surfaces. Engraved marks are made by removing the metal with the tool. The metal under the number/mark is not affected much. It may or may not help resuscitation. However, resuscitation is tried using appropriate etchant after polishing the surface.

In the other process, an electric engraver is used, especially on hard surfaces like that of stainless steel. In electrical engraving, the metal underneath is heated and gets fused. Erased marks can be resuscitated by applying appropriate etchant after polishing the surface.

If a mark is resuscitated, it must be recorded photographically and preserved by removing the etchant from the entity and covering the mark with transparent lacquer.

All parts (numbers) of marks do not pop up simultaneously, they appear at different intervals. A series of photographs are taken for a complete recording.

7.1.3.12 Prints

Prints from printing blocks are identified positively, as every printing block has its defects of omissions and commissions.

Numbers and dates printed from numbering and dating machines have, likewise, individualities that allow definite identifications.

> *In an interesting case, some lottery tickets, without carrying serial numbers were stolen from the printing press. When the prize of the lottery was declared, four claimants with the winning ticket number produced the tickets, to claim the prize. The authorities were perplexed to find so many tickets of the same number. They suspected that either the same number were printed on the ticket by machine failure or, at least three of the tickets were forged tickets.*
>
> *It was possible to identify the three forged tickets as their numbers were not printed on the official numbering machine. (CH)*

The identification of forged trademarks, designs, emblems, forged letterheads, identity cards, order forms, and currency notes is based on the identification of the defects or variation in the prints from the concerned block.

It is possible to link the forged prints to the offending blocks, if available.

7.1.3.13 Painted Marks

The printed registration number plate of a stolen vehicle is the first item which the thief changes. He puts up new plates, with a fictitious number or, he covers the real number on the original plate with a thick layer of paint and then puts a fictitious number on the painted plate.

In the latter case, careful removal of the new number and the new layer of paint can resuscitate the original number.

Some number plates consisted of letters and figures painted onto the metal plate. Obliteration normally consisted in painting over the surface with black or other paint and painting the false numbers. Similarly, some floral and ornamental designs, registration numbers, and some other identifying features all originally made on the painted motor vehicle surface are obliterated with new designs and numbers.

Resuscitation process of original mark/number involves the following steps:

1) The suspected obliterated surface is photographed first, *in situ.*
2) It is examined visually with varied illuminations, especially using acute oblique light. The obliterated marks may be visible sometimes.
3) The fresh paint of the number/plate is removed with chloroform, dioxin or some suitable mixture of solvents. The solvent used is tested before use.
4) The suspect painted surface is swabbed with the chosen solvent until the top layer paint loosens. It is swabbed away carefully with the cotton wool swab.
5) The obliterated marks appear at intervals. They are photographed and described. Each appeared number is photographed as soon as it appears.
6) X-ray shadowgraph sometime reveals the mark especially when underlying paint layer contains heavy elements, such as lead, while the top paint is free from such elements. Shadowgraphs should be tried.
7) In the case of the number-plates where original stuck number is removed/replaced, specular reflection may reveal the mark/number. An even light on the plate is thrown from an angle, and the plate is photographed from above. The brightly polished areas reflect the specular light. The marks appear black on a light background.
8) The plate is exposed to ultraviolet rays. The fluorescent images are photographed, and the mark/number is figured out from the image.

7.1.3.14 Broken or Severed Parts

Broken and severed part of an article(s) is sometimes found at the scene. The other part is recovered from the suspect, his vehicle or his house/office. If it is proved that, they originally formed part of the same whole; the "hand-in-glove" findings provide a definite proof of the suspect being at the crime scene.

The variety of broken or severed parts of evidentiary articles is limitless. Examples are: a broken bone, a nail, a tooth or a piece of skin, a tool, a glass, a wooden piece, a leaf, a cloth, an ornament, machinery, a twine, a board, a pipe, a stolen wire, a plastic hose, a paper sheet, a page or pages from a book or magazine or a newspaper. They have, at one time or the other, linked the criminal with the crime. However, one comes across the evidence only rarely.

> *A few years ago, the remnant of a button, with the central portion missing, was found at the scene. The missing portion was found firmly held by the threads of the stitches to the shirt of the accused. The two parts gave a hand and glove fit. The mechanical fit placed the criminal at the scene.*
>
> *The major part of the button had come off and fallen at the scene during the scuffle at the crime scene. (CH)*

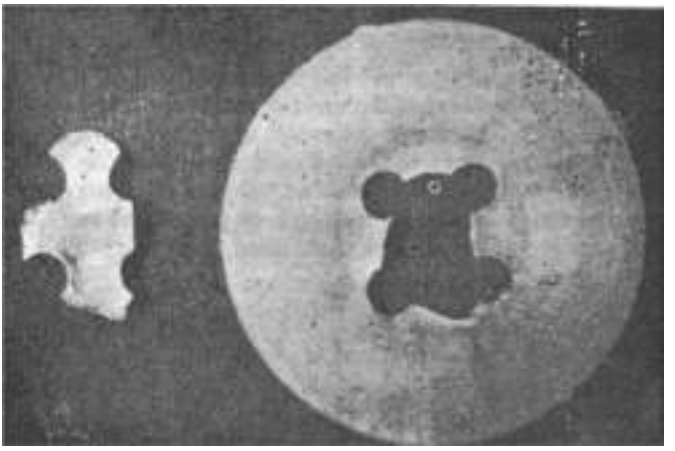

Fig. 7.5 **Fig. 7.6**

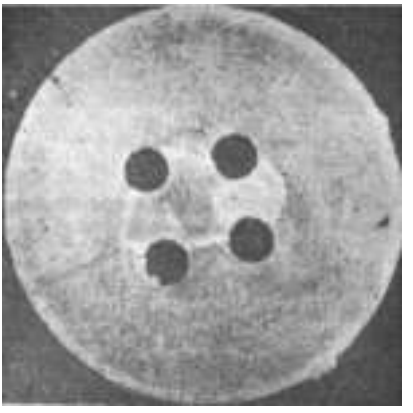

Fig. 7.7

A piece of button (Fig. 7.5) left with the shirt and another piece (Fig. 7.6) fell at the scene. mechanical fit (Fig. 7.7) of the two established the presence of the wearer, the culprit, at the scene

In cable/copper wire thefts the culprit sometimes changes the ends of the severed or broken parts intentionally or it may get mutilated otherwise. The severed ends can still be connected. The outer surfaces often carry striations; their presence and continuity links the two pieces.

The scratches may be natural or due to manufacturing defects.

A fingernail carries natural striations. A piece of finger nail can be identified in respect of the finger from which it has come even after years.

> *In one draw of a state lottery, nobody claimed the second prize at first. Later a ticket torn into many pieces was produced for the prize. The number of the ticket was on two pieces. It was necessary to find out if the pieces bearing the number came from one and the same ticket or not.*
>
> *The torn edges of the pieces did not give any definite indication. The background (security) printing, on examination revealed a gap of space of sixteen letters in the printed writing, instead of continuation.*
>
> *The two pieces bearing the number had obviously come from different tickets. (CH)*

Many other cases, involving mechanical were examined in the laboratory, including the following:

1. *Broken glass piece on a vehicle in a hit and run case was identified to the victim vehicle through mechanical fit of the glass piece. (CH)*
2. *A piece of cloth left in the barbed wire at the scene formed part of the shirt of the suspect from which, it had torn off. (CH)*
3. *A piece of paper, used as wad in a muzzleloader, found at the crime, was from a newspaper. The corresponding remnant piece was recovered from the house of the suspect. (CH)*

7.1.3.15 Contact Marks

Articles which are joined together by glue, nails or rivets exchange contact marks. If they are detached, changed or stolen, they can be interlinked through the contact marks exchanged by the two entities. A stolen tyre or a detached registration number plate of a vehicle or an ornamental piece from a vehicle, fallen off in an accident, can be identified in respect of the vehicle.

1. In a case of murder, the culprit speared his victim to death. In the process, the metallic spearhead struck in the body. The bamboo stick to which it was attached, came off. The culprit ran away with the stick.

Later, the extracted spearhead and the stick were sent to the laboratory.

The stick was attached to the spear head through two nails before they came off. The conical surface of the stick bore characteristic scratches from the two nail holes on the spearhead. A wax cast of the inner surface of the spearhead was prepared and taken out. It bore scratches from the nail holes. The examination/comparison of the marks on the wax cast and conical portion of the stick indicated the common source of the marks, linking the stick with the spearhead and identifying the spearman as the killer. (CH)

2. In a hit and run case, the investigating officer recovered some paint flakes from the scene of occurrence. When the suspected vehicle was recovered, it was possible to fit one of the paints flakes on the vehicle in spite of the fact that an attempt had been made to cover the spot with fresh paint. (CH)

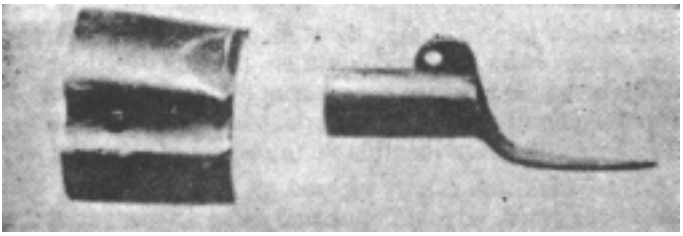

Fig. 7.8

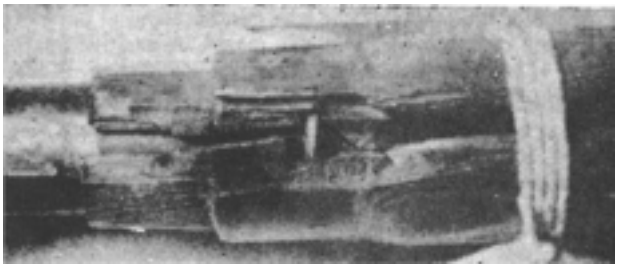

Fig. 7.9

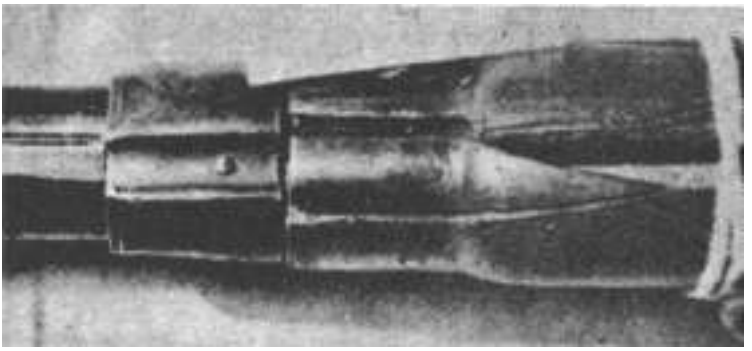

Fig. 7.10

Parts (Figs. 7.8 and 7.9) of a broken gun left at the scene fitted snugly to give the complete (Fig. 7.10) gun. the parts linked the scene with the suspect

7.1.3.16 Extraneous Material

The tools carry dust particles, paint, polish, and fragments of metals and wood from the place of contact. Similarly, if the tool is originally dirty, it may deposit the dirt at the place of contact. This type of evidence should be common. With modern scientific instruments, it is possible to evaluate the traces quite accurately. The evidence, therefore, should be searched, collected got evaluated used in the justice delivery system.

Fig. 7.11

Some common tools of the criminal

7.2 IMPORTANCE

The tool marks have great evidentiary value in criminal justice system:

7.2.1 Frequency

A criminal often uses some tools in the commission of a crime. For example:

1. If he is prying open a window, he uses a crowbar or a screwdriver,
2. If he is opening a lock, he uses a ghost key, a master key or a cutter,
3. If he is felling a tree, he uses an axe or a saw,
4. If he enters a house after cutting the bolt, he uses a hacksaw blade, and
5. If he steals copper wire or cable, he uses wire cutters,

The occurrence of tool marks is almost universal in all types of crimes.

7.2.2 Permanency

A tool is made of hard metal. The surface on which it leaves marks is ordinarily, made of softer material. There is minimal damage to the tool in the process. If the tool is not extensively used or misused and if the same is properly maintained, the marks are reproducible almost indefinitely. The permanency/quasi permanency can help to link the criminal with the crime even after a long time, through the tool recovered from the criminal and the tool marks collected earlier from the scene.

7.2.3 Individuality

The tool marks like fingerprints, foot and footwear marks and marks on bullets and cartridges are unique. No two tools, even made one after the other, in the same factory would create alike marks. They, therefore, establish a definite connection between the crime and the criminal. For example, a piece of wire is stolen (by cutting). The cut end left at the scene is sent to the laboratory along with the tool recovered from the suspect. The wire is found to have been cut with the recovered tool. The wire theft is pinned to suspect. This is so because no two tools even of the same make and batch made one after the other will have identical functional surfaces and leave identical marks on the surface cut, grazed or scratched by them.

7.2.4 Linkage

A culprit usually uses the same set of tools in the commission of the same type of crimes. If the tool marks from the various crimes are compared *inter se.* If they are found identical, they inter-link crimes.

7.2.5 Reconstruction

Careful study of the nature, position, direction and number of tool marks help in the reconstruction of a crime and thus it is possible to verify the prosecution or defence version of the crime.

> *In a case of murder, the accused claimed that it was an accidental self-killing. His version was that the victim attacked him with a sword. He threatened the victim with a gun. The victim in the meanwhile gave a sword blow, which he took on the barrel of the gun. It went off and killed the victim.*
>
> *The gun had a cut mark on its barrel and the story appeared to be correct. The action was enacted in the laboratory with the alleged gun and the sword. The gun was cocked and held in the firing position. A second person gave a number of sword blows with full force. However, the gun did not go off.*

When the gun was examined, no additional cut mark was observed on the barrel. Interestingly, on the other hand, the sword's sharp edge folded at the places where it came in contact with the gun barrel. It was crystal clear that the sword had not caused the cut mark on the gun or caused its firing.

The accused was confronted with the evidence. He confessed that he had created the mark with a Kukri (Khukuri). It was possible to get the corresponding cut when the test was carried out with the Khukuri.

The accused was prosecuted for murder. (CH)

7.3 LOCATION

The location of tool marks depends upon the nature of the crime. If earth or masonry work has been dug out, spades and shovel are the main tools. They leave marks on earth and masonry work. If the trees have been felled, axe marks are found on stumps of the trees. If planned planks had been stolen, tool marks connect the planks with the original source. If a house has been broken open, the tool marks are found at the point of entry (window, door, ventilator, wall or roof), on the locks, safe doors or on the cupboards. They may also leave on wall, furniture and door if the tool happens to touch them in a glancing blow.

If telephone, telegraphic or electric wires or cables are stolen, the cut ends of wires at the scene carry marks of the cutting instruments. The cut end may even give a 'hand-in-glove' fit with its counterpart recovered from the suspect.

Rubber or plastic cables and hoses do not retain identifiable tool marks. They cannot be identified in respect of the tools in most of the cases. The type of cutter used can be indicated sometimes. The analysis of rubber material may prove useful.

When the criminal enters the premises after breaking a glass window, the clothes of the accused are likely to carry glass fragments. The chips may permit the identification of the glass recovered from the site through mechanical fit or by comparing trace elemental profiles.

In hit and run cases, the culprit's vehicle may carry glass fragments, broken parts of the machinery or paint chips from the victim's vehicle, or, *vice versa.* The fragments or broken parts may connect the run-away vehicle through a mechanical fit with the corresponding part of the victim's or culprit's vehicle, as the case may be.

If a thief has removed a headlamp or other parts from a vehicle, the two parts carry contact marks. The patterns of contact marks connect the thief with the theft.

Tool marks are found on all types of surfaces and materials, wood, metal, stone, masonry, paint, earth, paper, cloth, sealing wax, plastics and leather. In fact, a surface coming in contact with pressure with a tool is likely to pick up its marks.

The tool marks are ordinarily visible as such. However, scratches in wood, paint and the like may need oblique light and darkness. The magnifying lens helps.

Iron pieces and fragments are conveniently located from the debris with the help of magnets. They may form part(s) of the tools used by the culprit.

Specific indentations or scratch patterns, imprinted by the victim or his vehicle on the offending vehicle, may provide irrefutable evidence of the violent contract.

In a hit and run road accident, a speeding car hit a cyclist from behind. The car crushed the fallen victim. The police apprehended the motorist soon after. They examined the impact marks on his vehicle. They found numerous indentation marks, which matched with the various damaged parts of the cycle. The two sets fitted with each other like a hand and gloves fit. The culprit was convicted on the evidence. (CH)

7.4 COLLECTION

7.4.1 Articles

Whenever possible, the original articles bearing the questioned tool marks are collected. Before removal, however, it is ensured that the position of the article with respect to its surroundings is properly established through description, photographs and sketches. Three photographs indicating the position of the article, the position of the mark on the article and the details of the mark are taken. The last photograph may have to be a macro photograph taken with artificial light.

An identification chit containing the case reference and the initials of the investigating officer and the photographer is placed before the photographs are taken, whenever possible.

When the article (of wood, metal and masonry work) is too big for convenient handling, the mark-bearing portion is cut, separated, sealed and sent in the usual way.

All articles bearing tool marks are collected. It is not desirable to pick and choose. Similarly, all suspected likely tools should be collected. The police should not use the collected tools to prepare test marks. The expert prepares test marks himself.

7.4.2 Casts

Sometimes it is not possible to collect the article or its mark-bearing part. In such cases, casts of the tool marks are prepared and collected. Some important materials and techniques to cast tool marks are:

7.4.2.1 Plasticine

Plasticine is available in most of the places and the casts with the same are easy to make. But they are not good. They do not pick up fine details and are easily deformed. They are prepared only when they are not required for permanent record or when the area bearing the marks is small.

A lump of plasticine is pressed in between two wet glass plates to give it smooth surfaces. The slightly moistened smooth area is pressed against the mark. The plasticine picks up the details. The moisture prevents sticking of the plasticine to the surface.

7.4.2.2 Dental Mass

Dental mass (like Kerr's dental mass) is available with a dental surgeon or a chemist selling dental materials. It can pick up fine details and record the marks permanently.

The material is kneaded under hot water and when it is soft and uniform in texture, it is pressed between two glass plates to give smooth surfaces. The material, while still warm and pliable is pressed against the tool marks and left at the site for some time. It picks up the marks. On cooling, it becomes hard and hence permanent record is thus obtained.

7.4.2.3 Adhesive Tape

Adhesive tape used to lift fingerprints can be used to lift shallow tool marks. It does not give good results in deep scrapes and indentations.

7.4.2.4 Latex and Plastic Solutions

Latex is rubber juice and is useful to collect tool marks. It is a good material for scrape marks but it is not so good for indentations especially deep ones, as, due to stretching, the dimensions of the lifted marks change.

The material is poured over the surface bearing marks. It is then allowed to dry for about six hours. The thin film or sheet formed is peeled off.

Plastic solutions (for example, cellulose acetate solution) are equally useful to lift the marks and are processed in a similar way.

Thermoplastic powders of low melting point and of light colour are also used. The molten material is poured over the marks. On solidification, it is picked up. It carries the marks.

7.4.2.5 Wood's Metal

Wood's metal[1] is an alloy which melts at a low temperature (<100° C). It is used to cast indentations with appreciable depth on metal or other surfaces.

The alloy is melted and poured into the mark. It solidifies on cooling and picks the details from the mark.

7.4.2.6 Plaster of Paris[2]

Plaster of Paris is useful when the dimensions of the tool marks are appreciable. The material is not so good to pick up fine details.

Plaster of Paris of the highest quality available should be used.

7.4.2.7 Tracing

Tool marks can be traced on a tracing paper/transparent plastic sheet/glass sheet. However, it is not recommended. The quality of the trace is highly subjective. It depends on the observation power/artistic skill of the person tracing the mark. Easy availability of the facility of photography has pushed out tracing almost completely.

7.4.2.8 Cellulose acetate casts

Cellulose acetate is useful material to lift shallow marks on a variety of surfaces, including wood, floors, and stones. Its solution in acetone is sprayed on the mark until the skin acquires a reasonable thickness (~ 1.5 to 2 mm). The nozzle is kept upward so that the solution falls on the mark with gravitational force only. Acetone evaporates in a short time. The cast is lifted. The marks thereon are evaluated.

Cellulose casts shrink. They should not be kept for long periods.

7.4.2.9 Silicone casts

Silicones are synthetic elastomers used mainly to obtain casts of many types of marks including tool marks. The silicone elastomers having plasticity, low viscosity, flexibility and elasticity are ideal materials for casting.

The silicone casts have the following advantages:

1. Silicone polymers are easy to manipulate.
2. The process is fast and safe.
3. They pick up fine details/margin details well.
4. They are amenable to pick up marks even from spaces that are difficult to reach.

---

1. It is an alloy of Bismuth (4 parts), lead (2 parts), tin (1 part) and Cadmium (1 part).
2. Plaster of Paris is partly hydrated calcium sulphate $(CaSO_4)_2$ 1/2 H_2O.

5. They cast are free from defects: deformation, air bubbles, shrinkage.
6. The life of the cast is long. They remain dimensionally stable for a long time.
7. They are strong and resist tearing.
8. They become rigid finally, without any shrinkage.
9. Rigidity confers stability to the cast.

The silicones being used are:

1. Polyvinyl Siloxane.
2. Silicone rubber.
3. Polyurethane elastomers.

In India, silicones are not used to cast tool marks to any extent, probably due to their prohibitive cost.

7.4.3 Packing

The packing of the evidence should ensure safety against breakage, contamination and loss. Whenever possible the articles are placed in a cellophane envelope. The open ends are closed. The envelopes are packed with cotton wool or clean dry rag padding in a suitable container. The marks should not come in contact with the packing material.

If the climate is humid and hot, a tool or the marks on iron and steel articles may rust. The mark may be damaged. A thin oil film applied over the surface prevents rusting. The oil film does not damage the marks and the extraneous deposit, if any, on the surface.

7.4.4 Standards

The investigator does not prepare the sample tool marks. The IO sends the tool along with the tool marks to the laboratory. The laboratory staff, using similar material to the one on which the crime tool marks were found at the site. If the material is hard, sample marks are prepared on softer material. In place of steel, iron, brass or copper, sheets of lead, zinc, tin or aluminium are used to prepare test marks.

The complete functional surface of the tool is used to obtain test marks from the suspect tool.

The angle at which the tool is applied has an important bearing on the clarity, number and dimensions of the scrape marks. The questioned mark is, therefore, carefully studied to get an idea of the angle at which the tool was applied. The sample marks are obtained at this angle.

It is often difficult to judge the correct angle of application. Therefore, a number of sample marks are obtained by changing the angle of application of the tool by about 5-10° for each sample. It is convenient to get the trial sample marks on plasticine or on the lead sheet. When the most suitable angle is discovered, the sample marks are obtained on the material corresponding to the original material or the one selected as a substitute.

7.4.5 Extraneous Materials

There are two types of traces collected/received:

1. Crime traces
2. Exemplar traces

7.4.5.1 Incriminating Traces

Incriminating traces may be found at different places. The collection technique varies somewhat:

1. When the traces of extraneous materials are found on the tool, the tool is placed in a cellophane envelope and then in a strong envelope or card box and sealed. The identification data along with the signature/date is put on the package, before dispatch.
2. When the traces of the material are found on the scratched surfaces the articles are placed in a cellophane envelope. If it is not possible to do so, the traces are collected on a paper with a fine and clean camel hairbrush, or by the techniques used to collect micro-traces. They are enclosed in chemist fold and the paper is packed and sealed as above.

7.4.5.2 Standards Sample Traces

It is difficult to collect the correct control sample of extraneous materials from scratched surfaces. Therefore, whenever possible, laboratory staff should help to collect the traces:

1) When the article bearing the suspected sample traces is transportable, send the article itself to the laboratory, observing usual formalities.
2) When the suspected surface/article cannot be transported to the laboratory the laboratory should be called to the scene to collect the sample traces.

The expert scratches the surface close to the area scratched by the tool of the criminal. He uses a similar clean tool. He takes care to scratch the surface to approximately the same depth as observed in the questioned scratch. The material scratched is collected/packed/sent to the laboratory, observing all the legal formalities.

The crime material deposited by a tool on the scratched surface may have come from the place where the tool was kept. A control sample of the extraneous material, in such cases, is collected from the tool, the toolbox or pockets of the culprit.

7.5 EVALUATION

7.5.1 Principle

"No two tools even of the same make, model or batch leave identical marks on the surfaces they worked on".

The principle is found sound both on an experimental and theoretical basis. it is impossible to get two exactly alike tools, even when they are manufactured consecutively in a rigidly controlled manufacturing process with the most sophisticated precision machines controlled through computers. Most of the tools used in the commission of crime are not manufactured under such controlled conditions. They frequently show a gross difference in addition to ever-present microscopic variations. Wear and tear and repair introduce additional nicks and protrusions, which give easily identifiable individuality to each tool.

If a tool is used extensively after the commission of a crime, especially on hard surfaces, the functional surface of the tool changes. The extent of change depends upon the extent of use or misuse. It may not be possible to identify the tool marks in respect of the tool if the working surface of the tool has drastically changed.

7.5.2 Techniques

The Forensic expert examines and compares tool marks visually, with the stereo/comparison microscopes and sometimes with Scanning Electron Microscope (SEM). In almost all cases, the marks are first photographed. In some cases, casts are prepared. Both photographs and casts, in addition to the examination/comparison of the original exhibits, are also used for examination and comparison However; the expert prefers the original marks for evaluations.

The expert uses varied techniques for the evaluations of the tool mark evidence according to the nature of the marks. The main modes include.

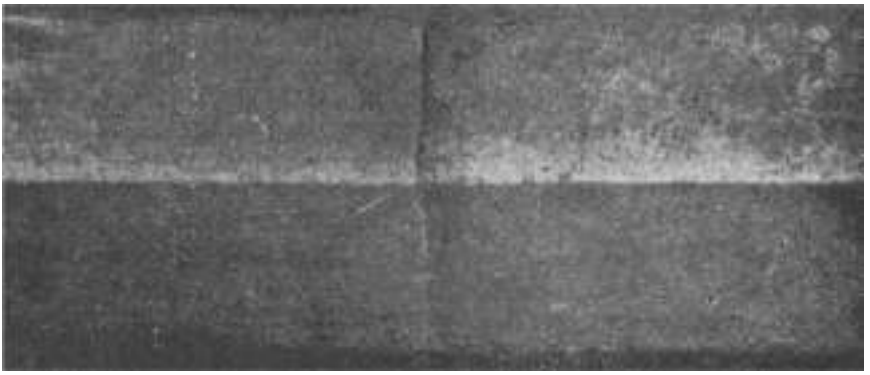

Fig. 7.12

A piece (C) of a broken sword found at the scene fitted with the sword (S) recovered from the suspect

7.5.2.1 Mechanical Fit

In cases, involving broken or severed parts of an article, a mechanical fit is tried first. Positive mechanical fit provides a conclusive proof that the parts originally formed part of the whole. The fit is illustration usually through photographs/sketches.

Sometimes the contour of the broken parts is not clear enough due to changes on the edges. In some cases, the article has appreciable projections and depressions at the cross-section. Their *inter se* fit provides the needed evidence.

There may be irregular marks on the original article. The cleavage sometimes divides the marks. Their continuations, from one part to the other, links the two parts. The irregularities are cast and compared *inter se*. The linkage is used where the mechanical fit cannot be done.

The broken or severed ends may carry microscopic details (striations), some deposit, some defect, logo, wear and tear marks on the outer surface of the severed parts. These marks may be adventitious, part of the manufacturing design, decorative patterns or accidental marks. They provide excellent mechanical fit evidence in some cases.

> *A few years ago, a train accident caused considerable loss of life and property. Sabotage was suspected. However, before the witch hunting was started, the laboratory staff was called in to examine scene of occurrence.*
>
> *A thorough search at the site gave an odd-looking twisted iron piece. It was found to form originally a fishplate nail. A detailed examination of the same, revealed:*

1. *The nail could be twisted only by strong mechanical force/pressure.*
2. *The flattening of the nail could take place only if a very heavy roller pressed it.*
3. *The twist suggested that the nail was held in a hole having strong edges when twisted.*

The pattern of events became clear. It seemed that the nail was placed in the space between the joint of the two rails. It made the speeding train to jump off the rail and caused the accident. Further check at site confirmed the thesis. The twisted nail had come from one of the joints.

Was the nail placed by the saboteurs? It was difficult to answer the question from the physical evidence alone. However, the accident had taken place near a town. The saboteur would have chosen a secluded place. It was, therefore, presumed that probably children placed the nail in the rails. Interrogation of the likely 'culprits' confirmed the same later. (CH)

7.5.2.2 Side by Side Match

Side by side match is the most common method for the examination and comparison of indentations, punch marks, prints from blocks, dating and numbering machines. In the examination and comparison, the main features scrutinised are dimensions, shapes, inter-distances design defects, wear and tear. If the features correspond, the match is established.

A transparent graph sheet placed over the photographs of the two marks, with the same magnification (or reduction) facilitates the examination and comparison.

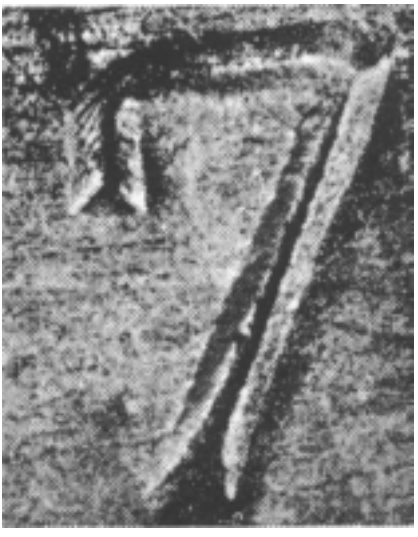

Fig. 7.13

Fig. 7.14

A punch used to change serial numbers of cars, recovered from a suspect, pinned the theft of a stolen car to the suspect. Digit 7 found on stolen car (Fig. 7.13) and the test prepared on a lead piece (Fig. 7.14) showed identity of common source

7.5.2.3 Composite Match

A composite photograph is convenient to prove the identity of the common source of indentations and prints. The photograph is taken through a comparison microscope. The images of half of each of the two, questioned and test, marks are adjusted at the dividing line. If the two halves complete the original mark without any appreciable divergence, the identity

of the common source is established. The technique is very useful and convincing. The marks should have sufficient dimensions and a number of nooks and corners to show a match or a divergence.

A few years ago, some members of the railway staff ganged up. One (or more) member of the gang would collect the used tickets at the destination station (Delhi) and return them to the station of origin to the member of the gang. He would re-stamp the ticket with new date, and sell them to the new buyers.

On investigation, dating dies (stamps) were recovered from the suspects. Comparison of the second (re-stamped date) on the resold tickets matched with the test dates prepared from the dies. (CH)

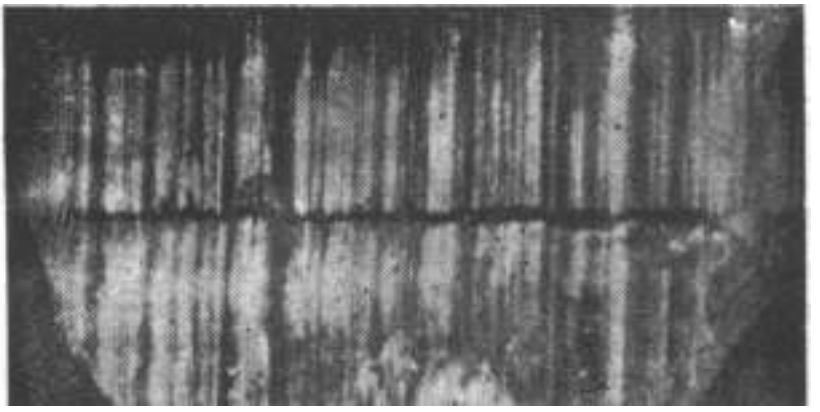

Fig. 7.15

A composite photograph of marks found on copper wire edge at the scene (C) with those obtained on test wire with the pliers (T) recovered from the suspect

7.5.2.4 Juxtapositioning Striations

As seen earlier, sliding/scraping tools leave striations (lines) marks on the scraped entity. The identity of the source (the tool) is established through the study and comparison of crime marks with the test marks, which the expert creates from the suspected tool. Stereomicroscope and comparison microscope is the equipment of choice for the study. The lines observed in the crime mark and test marks are brought at juxtaposition. If they show continuation across the two sets of marks, they show the same source of origin; that is, they have come from the same source. The technique is used invariably to examine and compare all types of striation marks.

It is worth noting that there will always be matching and non-matching lines in striation comparison. It is the preponderance of either which determine the match or non-match. In match, the number of continuing lines should be at least 70% and non-matching lines should not exceed 25%.

A comparison camera, in place of a comparison microscope, gives similar results. It does not offer any advantage over the comparison microscope. Rather, it is cumbersome and inefficient. It is not used in casework any longer.

7.5.2.5 Composite comparison of striations

Test and incriminating striation can also be compared without comparison microscope or comparison camera. Composite matching is done Two photographs, magnified or reduced the same extent, one each of the test and questioned marks are prepared. They are cut and pasted at the corresponding sites/positions. Preponderance of continuations/discontinuations of the striations indicates match/non-match (common/different source of the marks).

7.5.2.6 Stratigraphy

An instrument, stratigraph, has been developed to study the contour of striations on different objects. A delicate probe moves over the surface being studied. The changes in depths and elevations are accentuated and recorded on graph paper separately for the questioned and the test marks. The comparison of the graphs indicates the identity or non-identity of the common source.

The instrument does not offer any advantage over the comparison microscope. It is, therefore, of theoretical interest only.

7.5.2.7 Superimposition

Superimposition techniques can be used for indentation, scrape, punch and print marks. However, it is used mostly for indentation and punch marks. Two techniques are known:

1. In photographic superimposition a photographic print is prepared (say from the crime mark), and transparency from the test mark. The photograph and the transparency have the same magnifications or reductions, to get corresponding dimensions. The transparency is placed over the photograph. If the Various landmarks superimpose in the two, it matches, indicative of a common source of origin.
2. In the second technique, test marks are taken on an adhesive tape of appropriate size. The created marks are covered with a transparent plastic sheet. The print is now like transparency. The test mark print is placed over the crime mark, overlapping of the corresponding marks *inter se* shows match.

If necessary, the contrast is increased by smearing the tool with suitable fingerprint powder.

7.5.3 Sufficient Evidence

What is sufficient evidence in tool marks to declare the identity of the common source? It is a difficult question to answer and no generalisation is possible because the nature of marks varies from tool to tool. The experience of an expert is an important guide in this respect. In indentations, even a single characteristic formation may be sufficient. In scrape marks, one should be careful against being misled by an accidental match of a few lines. There should be no appreciable divergences and about a dozen lines should show a continuation in the test and crime exhibits when placed in juxtaposition. Fine striations are more trustworthy/valuable than the coarser lines.

> *In a blind murder case, the dead body of a young girl was found in a graveyard. The only evidence she carried on her person was a characteristic bite mark on her breast. The police investigations showed that she did not belong to the area and nobody has seen her in those parts. On logical considerations, the police believed that the girl had come to the place with a boy of a nearby college). He could be the likely killer.*
>
> *The dental casts were obtained from all the boys (over 400) of the college. Most of them could be eliminated easily. About half a score dental casts were ultimately left. A galaxy of dentists examined the mark and the cast and after due deliberations, they identified the cast of the teeth which had caused the bite mark. The suspect was given death sentence on the sole evidence of bite mark. (CH)*

The dimensions and clarity of a mark depend upon the angle, force and the direction of the application of the tool. The presence or absence of certain marks, both in the crime and the test exhibits, is often observed, it should not be mistaken for non-identity.

Contour match offers a different problem in elastic materials. The broken or severed edges, in the material, are often deformed in the process. The pieces do not show hand and glove fit. The manufacturing defects and wear and tear marks on the two parts should be searched for additional evidence. Comparison of the disputed and the specimen materials' elemental profiles also help in many cases.

In glass fragments, stone pieces and other hard substances, mechanically fit even through one millimetre is sufficient to constitute the identity of the common source.

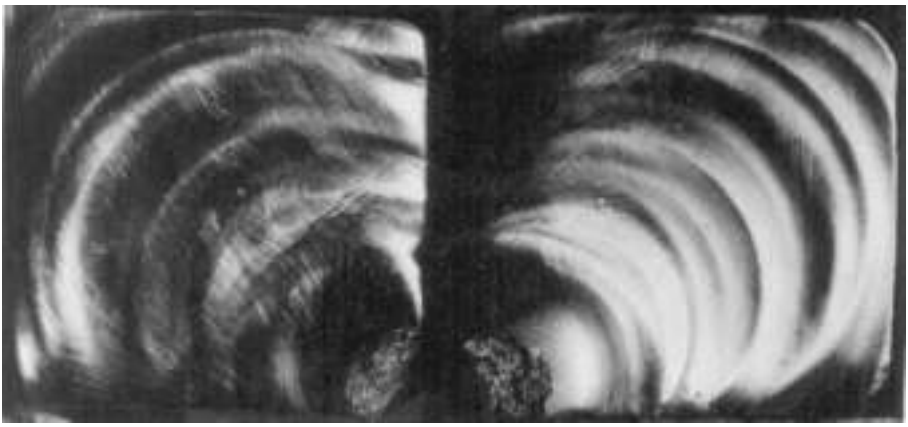

Fig. 7.16
The Two Iron Bars Cut with a Thread; One by a Jailbird, Other by Expert

APPENDIX I

Obliterated/Erased/Mutilated Marks

1. Methods to Remove Identification Marks

1) **Filing or grinding**

The original number is removed by grinding the number bearing surface with a power grinder. Filing is also used but it is inefficient and time consuming.

Usually a new number is stamped/engraved at the site of the old number.

2) **Peening**

Here the number bearing surface is pounded with the peen hammer (or ordinary hammer) to mutilate the identifying number.

3) **Over stamping**

In this process, the desired new number is stamped over the old number one by one. The die of the digit 8 is used to change those digits that have curvatures in their formation. For example, digits "0", "6", "9" are covered so well that it is difficult to detect the forgery with

a casual look. Likewise die of Digit '4' cover digits "1" and "7", admirably. All the digits are changed to prevent suspicion.

4) **Substitution**

In substitution, the perpetrator cut the metal bearing the number and weld another metallic piece bearing new identity number and hide the deed with paint. This has been observed in some stolen vehicles where chassis numbers of the vehicle were changed.

5) **Drilling-**

A number of holes are drilled with a drill around the original marks and the piece bearing the mark is knocked off (removed). A metallic piece bearing the new mark is welded at the site.

2. Resuscitation

Whenever a thief steals a metallic object for sale/personal use, the first thing he does is to erase the identifying marks in the form of serial number, logo and name of manufacturer. For example, if the stolen object is a vehicle he tries to change the original serial numbers on the engine and chassis by filing, hammering or chiselling. He changes the original digits and designs. He also changes the registration number on the plate. Sometimes instead of using a fresh registration number plate, the fictitious number is painted over the previous numbers after covering the first with a thick coat of paint. It is possible to detect the change and decipher the identifying marks, through physical and chemical processes including the following:

1. Etching,
2. Radiography,
3. Magnetic resuscitation

   The number bearing iron/steal object is placed in a magnetic field and iron filings, suspended in a liquid base, are spread over the surface. The digits and letters are formed by the arrangement of the iron filings on the edges of the punched writings.
4. Electrolytic dissolution or deposition

Etchant Resuscitation

It is a method of choice to resuscitate punched/engraved marks in India. The resuscitation of punched marks is based upon the principle that the concentration of the metal molecules underneath the marks is increased when it is punched/engraved. This increased concentration of metal reacts with the etchant at different rate than that of the un-punched surface. This differential reaction rate reveals the marks. It is recorded immediately photographically as in some cases it is transient.

The process is simple and does not require any special equipment. However, it is tedious, time consuming, somewhat hazardous and requires care, experience, patience and vigilance.

The process involves the following steps:

1. The site is photographed *in situ* to fix it position and identity.
2. The surface is cleaned to remove all dirt/paint/oil

3. The surface is polished. Emery sand papers of various grades are used. It is photographed. Enlarged photographs of the engraved marks after polishing, cleaning and removing paint and dirt may reveal the original number in some cases.
4. In some cases polishing reveals the part of the mark,
5. The etchants, relevant to the metal, are selected after testing. The surface of the same object, near to disputed mark bearing site is used for tests.

   Different etchants are used for different surface materials. In some cases, two etchants are used alternately. For example, on iron surface, Fries Reagent and 15% Nitric Acid are used alternately.
6. The polished surface is swabbed with the selected etchant repeatedly.

   The differential reaction of the etchant on the punched surface brings out the mark. Usually the mark appears in parts, most of the time. The part is photographed immediately as it can be fleeting mark only. It may vanish soon after. For example in the resuscitation of number on the chassis of a vehicle, only one/two digits may pop up at one time.

   The swabbing is continued until there is no likelihood of appearance of additional marks. The marks appear at intervals. They are photographed and recorded immediately.
7. The surface and the object is cleaned after resuscitation inputs to make it free from any chemical used in the process.
8. The revealed number is preserved on the site whenever possible, and
9. The site is oiled/lacquered to prevent rusting.

If the number is engraved, it may or may not be possible to resuscitate it. Chisel and hammer engraving may compress the metal somewhat and permit resuscitation.

If the engraving has been done with an electric engraver, melting of some metal at the site takes place. It changes the concentration of metal molecules at the site. Its differential reaction rate to etchants reveals the marks.

The registration number is painted on a plate. The thief often covers the number with a thick layer of fresh paint. He, now, paint the fictitious number thereon. The original number is easily resuscitated by simple solvent action. It removes the number and the new paint and the original number is revealed.

7.6 CASE LAW

7.6.1 Button Evidence[3]

That apart, the button which was recovered gives a direct clue to the presence of the accused at the time when the offence was committed. It is seen from Ex. p 6/A that the upper button on the cuff of the coat recovered from the accused was missing and the button recovered from the room where the deceased was murdered matches the button and supplies the missing one. The report of the forensic expert is that the button of the accused's coat establishes that it is the similar one. For this reason the accused had denied that the coat and the sweater belonged to him and the learned advocate on his behalf has urged in support of that plea that these were not recovered from the accused and the recovery memos were all fake and were written

3. *H.P. Administration v Om Prakash*, AIR 1972 SC 975 : (1972) 2 SCR 765 : 1972 Cr LJ 606.

subsequently. Accused in the statement under section 342 in answer to question 19, that he had signed the recovery memos dealing with the sweater, coat and blanket said that it was incorrect. He further said that he was made to sign three blank papers in the Thana and that he was filing a copy of the application in this connection while he was in the judicial lock up. Again in answer to question 35 whether he has anything else to say he stated categorically that on the 1 February 1967 he was taken to the Thana at 5 pm, on the 2nd February he was produced before the court from where a remand was taken and that on 7 February 1967 the S.H.O. obtained his signatures on three blank papers in respect of which he had sent an application after he was taken to the judicial lock up. This statement goes counter to the facts stated in the application of remand made to the magistrate on 2 February 1967 which was earlier extracted. A perusal of that remand application would show that these recoveries had already been made on the 1st and so there could be no question of his signatures being taken on the blank papers on the 7th for purposes of cooking up the recovery memos which according to the accused were not recovered on the 1st. The coat and the sweater were recovered from his room while the shoes and socks from his person as he was wearing them. There can be no doubt of the ownership being that of the accused.

7.6.2 Mechanical Fit[4]

Accused No. 3 in this case led the police party and the *panchas* to a place near a small temple of a deity. Accused No. 3 took out a Dharia from the hedge of thorns. The Dharia was attached. A *panchanama* was made. The Dharia which was attached had its blade broken. There were blood like stains on it. Article 13 was the Dharia produced in court. The blade which was found from the scene of offence near the dead body and the dharia which was attached matched. The High Court saw the two pieces matched completely at the broken edge and there was no doubt in coming to the correct conclusion that the broken piece of blade was broken from this particular Dharia and the remaining portion which was recovered according to the prosecution from the hedge was the other matching part of it.

7.6.3 Weapon used in commission of crime[5]

The learned counsel for the accused-appellant has contended that the recovery of the weapon used in the commission of the crime is not satisfactorily established. In the present facts, with regard to the death of the deceased, after the incident, the inquest *panchnama* was prepared and the dead body was sent to the Civil Hospital, Nanded for post mortem examination. The doctor's report indicates that it was a homicidal death. The blood-stained clothes of the deceased and also blood-stained "katti" was recovered at the instance of the appellant from his house in the presence of panchas under the memorandum *panchnama* which was in the presence of the witness. The same had been sent to the Regional Forensic Laboratory, and a report had been obtained. In that circumstance, when the weapon used for committing the offence had been recovered in the manner known to law and the appropriate reports were also obtained, the contention on behalf of the appellant that the recovery of the weapon is not believable cannot be accepted. When the accused-appellant as also the deceased were inside the house and in the circumstances death on the spot had occurred, the death in the manner as contended by prosecution and spoken to by witnesses is to be accepted. Further, the said witnesses were also chased by the appellant from the very spot where the incident occurred. That apart, the "katti" was recovered and the forensic report also supported the case of the prosecution.

4. *Bharvad Bhikha Valu v State of Gujarat*, AIR 1971 SC 1064 : (1971) 2 SC Cri R 330 : 1971 Cr LJ 927 (SC).
5. *Kamlakar v State of Maharashtra,* AIR 2019 SC 2952.

CHAPTER 8

FIREARMS FORENSICS[1]

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1. See B R Sharma, *Firearms in Criminal Investigation and Trials*, LexisNexis, India, 2017 for comprehensive/ Integrative discussion on Forensic Ballistics.

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Fig. 8.1
India's INSAS 5.56 mm Assault Rifle

Fig. 8.2
1. AK 47: Assault rifle 2. Remington' section 12 bore Pump 3. UZI: Israel's famous pistol; Some famous guns

8.1 IMPORTANCE

The abuse of firearms figures prominently in most of the heinous crimes like murders, dacoities, robberies, assassinations, mob violence and police encounters. The firearm evidence, therefore, is indispensable in handling such cases.

The linkage of firearm-criminal through fired ammunition is well established. Its evidential value is now on the same footing as the fingerprint evidence because the individuality of the gun's marks impressed on a fired cartridge or on a bullet is universally recognised. So much so that these marks are called thumbprint of the firearm.

The assertions of the expert that no two firearms even of the same make, model, batch and made one after the other leave identical marks on fired ammunition, are accepted like the assertions of the fingerprint experts that no two fingerprints from two different fingers even from the same person are alike. Accused persons were convicted and sentenced and the sentence was maintained even by the Apex court (Supreme Court) solely on firearm evidence.

It is, however, necessary to link the firearm with the culprit beyond a reasonable doubt. It is in addition to the proof that the firearm recovered from the culprit, fired the fatal cartridge/bullet recovered from the scene/body of the victim. Further, it has to be proved that the firearm was in the possession of the accused at the time when the crime was committed.

The firearm evidence helps the investigations in many ways. It helps to:

1. Ascertain whether the given incidence is a case of murder, accident, killing in self-defence or suicide.
2. Determine the sequence of events.
3. Verify versions.
4. Establish the number of shots, their directions and ranges and the number of firearms used in the incident.
5. Identify the shooter through GSR
6. Determine the time of the fire
7. Distinguish between real and fake incidences.

8.2 NATURE

Firearm is the best leveller of the weak and the strong

8.2.1 Firearms

A firearm is a device to hurl a projectile or projectiles. The force pushing the projectile(s) is from the expanding gases, created by the burning of propellant powder charge at a very high rate. In air rifles and pistols the projectiles are hurled by the expansion of compressed air.

According to Indian Arms Act, a firearm means arm of any description, designed, adapted to discharge a projectile or projectiles of any kind by the action of any explosive or other forms of energy and includes:

1. Artillery, hand grenades, riot pistols or weapons of any kind designed or adapted for the discharge of any noxious liquid, gas or other such things.
2. Accessories for any such firearm designed or adapted to diminish the noise or flash caused by the firing thereof.
3. Parts of and machinery for manufacturing firearms and cartridges, platforms and appliances for mounting, transporting and servicing artillery.

In forensics, usually small arms are encountered. They are defined as:

> *Small Arms are small calibre firearms, which can be easily hand-handled, carried and operated by a single person. They include handguns, (pistols and revolvers, machine pistol[2]) which are fired with one hand; shoulder arms, which are fired from the shoulder (shotguns, rifles, assault rifles, carbines, muskets) and sub-machine guns/ light machine guns fired from a stable pedestal. They may be single shot/semi-automatic/fully automatic firearms.*

2. They are pistol and machine gun combinations. They fire pistol ammunition, are automatic with magazine.

UNO has defined small firearms as:

> ***Small arms are, broadly speaking, weapons designed for individual use. They include, inter alia, revolvers and self-loading pistols, rifles and carbines, sub-machine guns, assault rifles and light machine guns.***

In India, commonly used firearms, in crimes, are:

1. Shotguns
2. Revolvers
3. Pistols
4. Rifles
5. Sub-machine guns
6. Machine guns
7. Muzzle Loaders
8. Improvised firearms[3]

Fig. 8.3
4 Barrel Pistol

There are numerous variants of firearms in each category.

The most commonly used weapons are 12 bore shotguns and improvised firearms, in India.

8.2.2 Firearm Parts

A firearm has three main parts: barrel, action and stock.

8.2.2.1 Barrel

The barrel of firearm provides space for the expansion of gases. It has a chamber to house the cartridge in most of the firearms (revolvers excluded!). The chamber is on the back end of the

3. They are non-factory-made crude firearms, usually made by local blacksmiths, conforming to no specifications. Most of them are dangerous to the user.

barrel. In many firearms, there is a "leed" between the normal barrel bore and the chamber. Leed is gradual narrowing down the chamber bore from the chamber diameter to that of the barrel bore through a tapered hole.

Leed prevents tilting of the projectile during its journey from the chamber to the barrel.

There is no chamber in the barrel of a revolver. A revolving cylinder houses the cartridges instead. The name "revolver" of the firearm is perhaps after the revolving cylinder.

8.2.2.2 Action

The action consists of the mechanism for loading, firing, extraction and ejection of the cartridges, the magazine and the safety devices, if any. The arrangements for the location of the constituent parts vary in different firearms.

8.2.2.3 Stock

The stock of a firearm holds the other parts in position and provides support for firing purposes. In automatic and semi-automatic pistols, the stock also carries the magazine.

The parts, which imprint/impress identification marks on the fired ammunition, are:

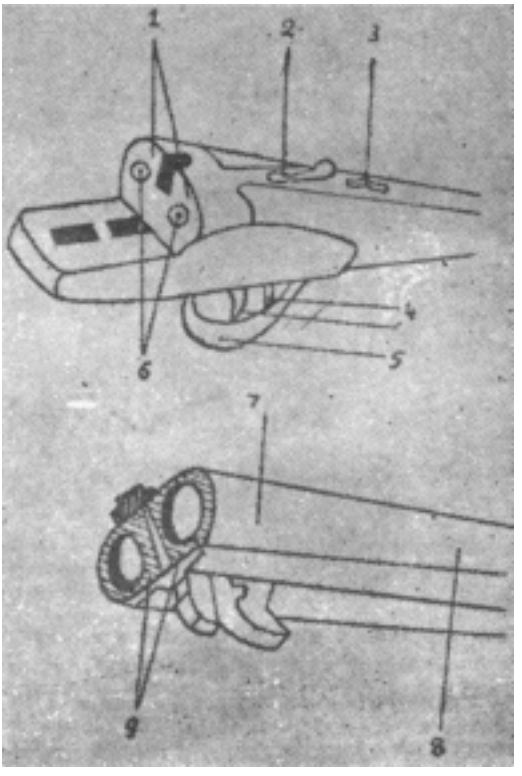

Fig. 8.4

Parts of a guns.
1. Breech Face 2. Breech Lever 3. Safety Catch 4. Triggers 5. Trigger Guard
6. Firing Pins 7. Chamber 8. Barrel 9. Extractor

8.2.2.4 Firing Pin or Striker

It is the part of the firearm, which, on pressing the trigger, moves forward and strikes the cartridge with force. It is located in the breechblock in shotguns, in the bolt heads (also known as breach block) of bolt-action rifles and in the moving breechblock in automatic and semi-automatic firearms. It forms part of the hammer in revolvers. It is the most important part for the identification of fired cartridges. The firing pin indentations are invariably present in all fired cartridges. The indentations alone permit the identification of the firearms in about 95% cases.

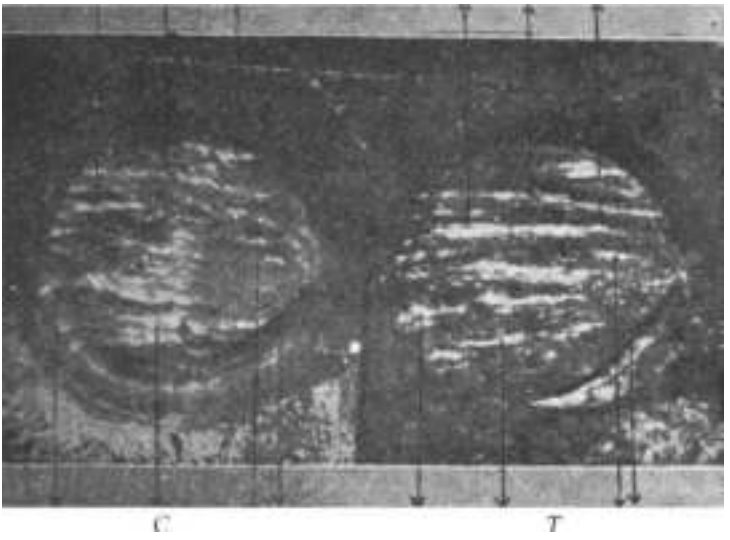

Fig. 8.5

Firing pin impressions (C and T) from the common source

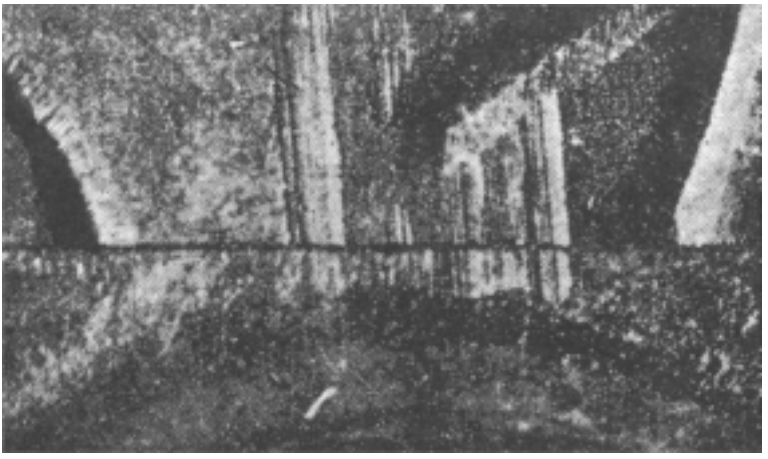

Fig. 8.6

Firing pin scrape marks indicating the common source

8.2.2.5 Breech Face

The area surrounding the firing pin hole is the breech face. It seals the barrel from the chamber side and holds the cartridge case when the recoil pushes it back due to on firing. It comes in close contact with the base of the cartridge and the irregularities of its surface are imprinted on the cartridge.

The breech face is the second most important part of a firearm from the point of view of identification of a fired cartridge in respect of the firearm, which fired it. The marks are particularly important in cartridges developing high pressure. The cartridges fired from standard shotguns in most of the cases, do not carry sufficient breech face marks. On the other hand, rifles developing high pressures imprint conspicuous breech face marks.

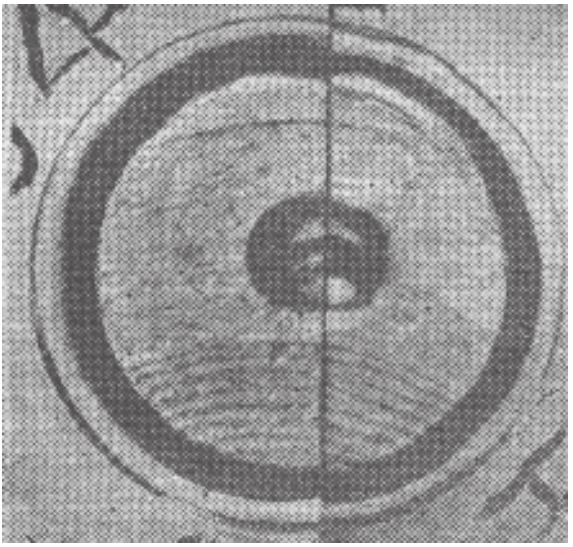

Fig. 8.7

Breech face marks, unusual pattern, sufficient to establish the common source

8.2.2.6 Chamber

The chamber surface of a firearm has microscopic imperfections. These irregularities on the surface usually do not mark the fired cartridges because the diameter of the chamber is somewhat larger than the diameter of the cartridge. The cartridge, therefore, does not come in close contact with the surface of the chamber even after expansion. Sometimes, there may be some abnormality or some extraneous material deposit in the chamber, which may reduce its effective diameter.

If a local blacksmith has made the firearm, He may not be aware of the required tolerance in the chamber it is not there. In such cases, the cartridge is held tightly in the chamber. On firing, the cartridge case expands and comes in close contact with the chamber surface and the chamber marks are imprinted on the cartridge. Chamber marks are found frequently on cartridges fired from improvised firearms.

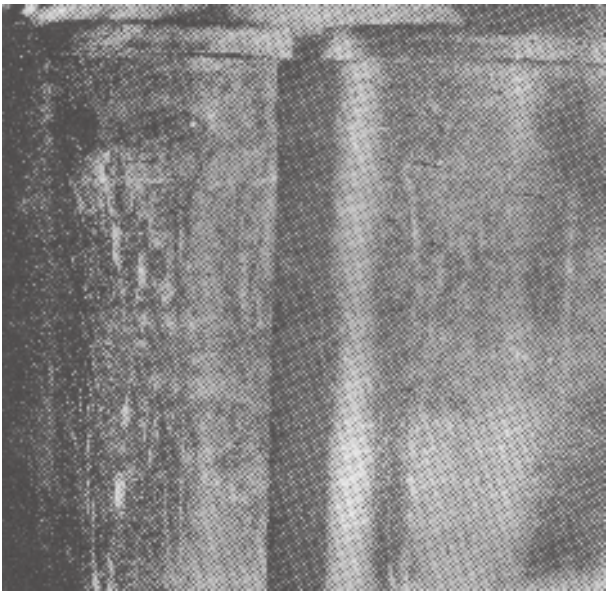

Fig. 8.8

Chamber marks, often unavailable, but in this case sufficient to establish the common source

8.2.2.7 Extractor and Ejector

Extractor and ejector of a firearm are of varied designs and forms. They come in contact or strike the casing of the cartridge fired through the firearm; or, in the extraction/ejection process. They imprint their surface irregularities on the shell. The marks are often insufficient for identification purposes. They are individualistic only in rare cases to allow independent identification of the firearms. However, they do corroborate the findings.

The marks provide useful class characteristics in "no gun" work to identify the type of firearm used to fire the given cartridge.

The marks also indicate the orientation of the cartridge in the chamber.

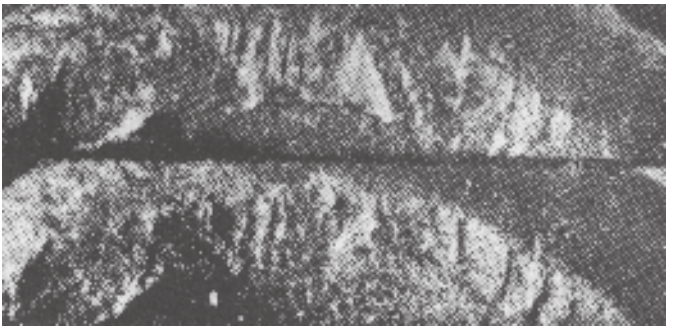

Fig. 8.9

Breech face marks, unusual pattern, sufficient to establish the common source

8.2.2.8 Barrels

The barrels of all firearms imprint marks on all fired projectiles, which fit tightly in the barrels. In rifled firearms, the marks are from the imperfections of the lands and the grooves, mostly from the lands of the barrels. Likewise, in smooth bore firearms the imperfections of the inner surface of the barrels create striation (line) marks on the projectiles. Balls, slugs and bullets fired from smooth bore firearms have been identified in respect of the used firearm in criminal cases from the striations, which the latter leaves on the former.

The bore of a barrel is also called calibre or gauge. It is measured in millimetres, in most parts of the world. In the United Kingdom and some Commonwealth countries it is measured in thousandths of an inch. In the Unites States of America, it is measured in hundredths of an inch.

The calibre of a firearm is usually nominal. Its exact measurements frequently differ from the nominal bore size. Thus, the diameter of the bore of .38 revolvers is about .334 inches only. The actual diameter of a bullet also differs from its nominal (designated) calibre.

8.2.2.9 Choked Barrels

When the diameter of a barrel of a shotgun is the same throughout the barrel bore, it is a true cylinder barrel. However, the bore of barrel of a shotgun is often reduced near the muzzle end of the barrel. That is, the diameter near the muzzle end is slightly less than the diameter of the bore of the rest of the barrel. Such barrels are called choked barrel. The choke is full, half, quarter or improved cylinder, if the diameter at the muzzle end is reduced by about one, half, one quarter and one-tenth of a millimetre, respectively.

The choke increases the effective range of a shotgun by increasing the concentration of pellets per unit area at the target. For example, for every hundred pellets fired, seventy pellets will fall in a circle of seventy-five centimetres at a range of thirty metres in a fully choked barrel. The number of pellets falling in an equal circle under similar conditions for a true cylindrical barrel is forty only.

8.2.2.10 Leed[4]

When a bullet comes out from the cartridge case (and chamber) and before it sets into the grooves, it slips over the leed and is imprinted with the slippage marks. They are often useless for identification purposes but the bullets, which fit loosely in the barrel and do not take up barrel marks may be identified, sometimes, in respect of the suspected firearm through the slippage marks left by the leed, by special techniques.

8.2.3 Classification

Firearms have been classified in many ways including the following:

1. Barrel bore characteristics classification
2. Functional mode
3. Calibre based classification
4. Loading mode
5. Handling Mode classification

8.2.3.1 Barrel Bore characteristics

Firearms bores are either smooth or rifled.

4. It is the tapered barrel part between the chamber and the normal barrel bore with progressively reduced diameter from that of the chamber to that of barrel bore.

8.2.3.1.1 Smooth Bore

The shotgun, the muzzle-loading gun, the musket, most of the improvised firearms and the signal pistols and cattle guns are the common smoothbore firearms. Here the barrels are smooth and cross section of the bore inside forms a circle at any point. Ordinarily, pellets and shots (small lead balls) are fired from smooth bore barrels. Single projectiles, like balls and slugs (ordinary or rifled) are also fired sometimes.

Shotguns with rifled barrels are known but they are rare. They have, in most of the cases, two shallow grooves. The grooves increase the range and accuracy of aim when ball charge is fired. "Paradox" shotguns are similar in performance. In these guns, a few inches of the barrel near the muzzle end are engraved with grooves.

A shotgun is a short-range firearm. It is used for hunting small game. It does not give a very accurate aim when a single projectile is fired. The necessity of accurate aim is obviated when a cartridge with a large number of pellets or shots is fired. The spread of shots covers increasingly larger areas with the increasing range due to dispersion of pellets or of the shots.

Shotguns are designated with reference to the size of their bore. If the diameter of the bore of a shotgun is equal to the diameter of a spherical lead ball weighing one-twelfth of a pound, the gun is called a 12-bore shotgun. If the ball equal in diameter to the diameter of the shotgun, weighs one-eighth of a pound, the gun is called an 8-bore gun and so on. When the bore diameter of a firearm is less than half an inch, the bore is designated in thousandths of an inch, *e.g.*, musket's bore is given in inches (0.410).

8.2.3.1.2 Rifled Bore

Rifled firearms have grooves and lands in their barrels. The grooves are canal like furrows cut out from the barrel in spirals, by giving a regulated twist to the cutter or to the barrel to get the groove in the required spiral shape. The number, angle of twist, direction, depth and width of the grooves vary with various manufacturers. Two to seven grooves are common though multi-micro-groove firearms (firearms with shallow and numerous grooves) are also in the market, though not common in India.

The raised portion between the two grooves is called a land. The number, direction, and twist of lands are the same as the corresponding of the grooves. The width may or may not be the same.

The lands (and sometimes grooves) scratch striations (lines-like linear markings) on the projectiles passing through the barrel. The width, depth, twist and direction of the lands and grooves on the projectile provide class characteristics of the firearm. The finer details of the striations in the grooves and lands give the individualising characteristics of the barrel.

Pistols, revolvers, sporting rifles, service rifles and machine guns are the important rifled firearms. They are quite popular with the criminals and commonly used in offences.

8.2.3.2 Function

Functionally, the firearms are divided into the following categories:

8.2.3.2.1 Single-Shot Firearms

Target pistols, some rifles and most of the shotguns are single shot firearms. The firearm has to be loaded for each firing. Double-barrelled shotguns are also of this class, though two shots can be fired without reloading, one from each barrel one after the other. Most of the improvised firearms fall in this category.

8.2.3.2.2 Repeaters

A firearm may be a repeater. The firearm has a magazine to house two or more cartridges. Extraction, ejection and reloading are done in a single manual operation. Some shotguns and most of the old bolt-action service rifles (.303 rifles!) belong to this, class.

Pump action shotgun also belong to this class.

8.2.3.2.3 Self-loaders

A firearm may be a self-loader (semi-automatic). When a self-loading firearm is fired, the fired cartridge case (empty shell) is ejected and a fresh cartridge from the magazine is loaded automatically. Thus, the firearm is ready to fire a second shot. The shooter has to just press the trigger. The process of extraction, ejection and reloading is repeated on second and subsequent fires until the magazine is empty. Semi-automatic pistols and modern service rifles belong to this class.

8.2.3.2.4 Automatics

An automatic firearm has all the qualities of a self-loader. In addition, after pressing the trigger for the first shot firing, the firearm goes on firing automatically as long as the trigger is kept pressed and the magazine is not exhausted. Some pistols (including machine pistols), sub-machine guns belong to this class. Many of them have a mechanism to change them from automatic to semi-automatic action.

8.2.3.2.5 Assault Rifles

Assault rifles have both automatic and semi-automatic actions. These rifles are being used extensively in the services all over the world. AK 47, AK 74 are world class assault rifles. They are famous (or notorious?) in our country because of their misuse by the terrorists. The Indian Government has also come up with INSAS 5.56.

8.2.3.3 Calibre-based Classification

Rifled firearms are often classified according to their calibre. Thus, we have 6.25 mm firearms, 7.65 mm firearms, 9 mm firearms and many other calibre-based firearms.

In smooth bore firearms, we have similar classification. Thus, we have 8-bore, 12-bore, 16-bore and the like shotguns

8.2.3.4 Loading Mode Classification

In loading mode classification, we have muzzle-loading, breech-loading or magazine-loading firearms. The terms are self-explanatory.

8.2.3.5 Handling Mode

Handling mode classification classifies firearms in the following categories:

- Handguns
- Shoulder arms
- Light machine gun small arms. They are comparatively heavy firearms and are fired from a pedestal (platform); or, by two or more persons jointly.

8.3 AMMUNITION

8.3.1 Legal Definition

According to the Indian Arms Act, 1959, under section 2,(b), "Ammunition" means:

Ammunition for any firearm, and includes:

1. *rockets, bombs, grenades, shells* [5] *[and other like missiles,]*
2. *articles designed for torpedo service and submarine mining,*
3. *other articles containing, or designed or adapted to contain, explosive, fulminating or fissionable material or noxious liquid, gas or other such thing, whether capable of use with firearms or not,*
4. *charges for firearms and accessories for such charges,*
5. *fuses and friction tubes.*
6. *parts of, and machinery for manufacturing, ammunition, and*
7. *such ingredients of ammunition as the Central Government may, by notification in the Official Gazette, specify in this behalf,*

The Act, thus, includes a variety of articles in its definition of ammunition. But in forensic ballistics, ammunition means the cartridges, shells, propellants, projectiles, wads and the initiation system [the metallic cup (percussion cap), the anvil inside, the initiating explosive and other chemicals to ensure smooth, efficient and safe initiation] commonly used in small arms.

The important parts of a cartridge are; the powder charge, the projectile charge, the primer, the cap composition and the shell. The shell holds the propellant, the projectile charge and the cap composition. The charge is separated from projectile charge with wads, especially in shotgun ammunition.

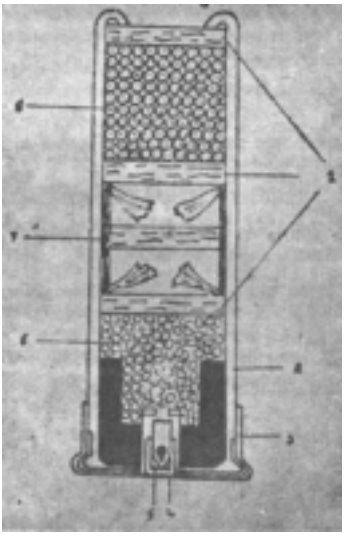

Fig. 8.10

Parts of a 12 bore Cartridge.

1. Wads 2. Case 3. Metallic Base 4. Percussion Cap 5.
Primer Touching the Anvil 6. Powder Charge 7. Cushion Wad 8. Pellets

5. Subs. by Act 42 of 1988, section 2, for "and other like missiles" (w.e.f. 27-5-1988).

An innovation in the manufacture of cartridges is a caseless cartridge. An RDX based powder charge, in the form of a mould is attached to the bullet. The cartridge is fired from specially made firearms. On firing, the mould (made from explosive) is the propellant for the cartridge. It burns and produces gases which propel the projectile. Practically nothing is left in the chamber after firing.

8.3.2 Classification

The various constituents/items, which form ammunition are briefly discussed here.

8.3.2.1 Gunpowder

The gunpowder (also called black powder) consists of potassium nitrate, sulphur and charcoal roughly in the proportions of 75:15:10. The powder is not suitable for high velocity ammunition, as large amounts of the powder are required to get high velocity. Besides, it gives irregular ballistics and leaves a considerable amount of solid residue, which tends to foul the barrel. If large quantities of black powders are used in a cartridge, they create excessive recoil.

Most of the countries do not use black powder as the propellant. It is still used in India to refill fired shotgun shells and in muzzleloaders.

In a murder trial, the defence counsel cashed upon the ignorance of a doctor who appeared as a witness. The doctor in cross-examination stated that he observes which he believed had come from a cartridge containing black powder and not from a cartridge containing smokeless powder. He believed that smokeless powder does not cause blackening.

The defence counsel later ascertained that the cartridge allegedly fired by the culprit and found at the scene of occurrence contained smokeless powder.

The defence counsel argued that the gunfire injuries on the person of the victim was caused by a cartridge containing black powder as propellant and the cartridge allegedly fired by the accused contained smokeless powder. He, therefore, could not be the murderer. He got an acquittal for the murder from the trial judge.

The prosecution filed an appeal in the High Court against the acquittal. The high court requisitioned the services of the author. He test-fired similar cartridges recovered from the accused in the presence of counsels from both the parties. Test firing revealed that blackening is caused with cartridges containing smokeless powder as the propellant.

On the request of the defence counsel the colour of the target was made to correspond roughly with the colour of the deceased (brown paper was used) and it was covered with the clothes of the deceased in some test shots. Blackening was still observes observed under these conditions, from the alleged distance.

The firearm involved in the crime and cartridges recovered from the accused (similar to those involved in the crime) were used for test purposes. (CH)

8.3.2.2 Smokeless Powder

Smokeless powder is now almost the universal propellant for small arms ammunition. The active constituents of the powder are nitro-glycerine and nitrocellulose. When only one active constituent (nitrocellulose) is used as a propellant, the powder is called single-base powder.

No single base propellant is made from nitro-glycerine because it develops a high temperature, which "washes" the barrel of the firearm. Besides, its high power tends to shatter the device in which it explodes.

When the two explosives are used together, the propellant is called double-base powder. The active constituents are mixed in such proportions with other substances (commonly

barium nitrate, potassium dichromate, Vaseline and the like) as to achieve the best ballistics from the propellant.

The powder is made in various shapes and sizes to get required ballistics. It is commonly used as flakes, tubes or rods. It may be porous or non-porous. The rate of burning is more for porous/tube forms of the propellant.[6]

The propellants with the increasing rate of burning are called progressive powders, those with the decreasing rate of burning are called degressive propellants.

The exact shape, size and chemical composition of propellants vary with different manufacturers. Therefore, their differentiation and identifications are possible.

8.3.2.3 Projectiles

The projectiles have different shapes, sizes, weights and constructions. Pellets, shots and balls are used in shotgun and musket ammunition. The size and number of the pellets and shots vary with different types of cartridges. The nomenclature of the cartridges with respect to the sizes of pellets and shots is the same in India as in the United Kingdom and other Commonwealth countries. It is different in the United States of America and other countries.

Table 8.1

Projectile charge of shotgun cartridges

Number	No. of projectiles per ounce[7]	Projectile's diameter mm.	Projectile's weight in g
LG	6	9.14	4.54
SG	8	8.43	3.54
Special SG	11	7.57	2.58
SSG	15	6.83	1.89
AAA	35	5.16	0.81
BB	70	4.09	0.40
1	100	3.63	0.28
2	120	3.41	0.24
3	140	3.25	0.20
4	170	3.05	0.17
5	220	2.79	0.13
6	270	2.59	0.10
7	340	2.41	0.08
8	450	2.21	0.06
9	580	2.03	0.05
Dust	2770	1.2192	0.0109

6. The provide larger surface area for burning.
7. An ounce = 28.35 g.

The usual quantity of the shot charge in a 12-bore shotgun cartridge is about thirty grams. It varies from twenty-five grams to about thirty-five grams. Sometimes slugs of special constructions (rifled) are used in shotguns to give them spin to increase their range and to make the aim more accurate.

Bullets are used as projectiles in rifled firearms. They are made of lead alloy, for low-velocity ammunition and high-velocity ammunition bullets have jackets made of copper, cupronickel alloy or steel. The core of the jacketed bullet is ordinarily of lead alloy. Steel bullets and bullets, which have partly steel core and partly lead core are also being used currently in-service ammunition.

Lead bullets are used in revolvers and sometimes in pistols. They are not suitable for cartridges developing high velocity because lead bullets are deformed due to excessive heat produced melt the metal as lead has a low melting point. Nor are they satisfactory for magazine loading firearms because they obstruct the loading mechanism, sometimes. Jacketed bullets are being used increasingly now both for pistol and revolver ammunition.

The bullets have various shapes and forms. They may be streamlined, boat-tailed or they may have a flat base. They may have a flat nose, a round nose, a pointed nose or a pencil nose. The bullets may be short, medium or long.

A bullet may or may not have cannelures (corrugated circular surface near the base). The lead bullets have cannelures, usually. Some grease is placed in the cannelures for lubrication during its passage through the barrel.

The nose of the jacketed bullet may be thin, hollow, exposed or cut for greater wounding effect due to fragmentation. In earlier British Raj, Dum-Dum bullets for service rifle (0.303) were used. They had thinned jacket at the nose. The bullet shatters in the body and caused extensive trauma, injuries and deaths. Hollow point/soft nose bullets of the modern ammunition give similar terminal ballistics. They shatter inside the body. These and other types of expanding bullets are being used increasingly in service ammunition.

The diameter of a jacketed bullet is slightly larger than the diameter of the barrel bore for which it is meant. This seals the barrel and prevents the escape of gases. Besides, it ensures proper setting (housing/fitting in the barrel) of the bullet in the barrel which ensures proper spin. The diameter of lead bullets is either equal or slightly less than the diameter of the barrel. Lead bullets expand and fill the bore. The larger diameter would cause excessive lead fouling.

8.3.2.4 Cartridge Case

Cartridge cases are made from a variety of materials, in varied shapes and sizes, all determined by the nature of the firearm and the ballistics requirement. Some of the salient aspects have been discussed below.

1. The tubular portion of the cartridge case may be made of paper (common in shotgun ammunition in India), or it may be made of metal. Plastics are also gaining popularity especially for shotgun ammunition. Brass is the commonest material used for shells though iron and aluminium are also being used.
2. The base of the cartridge case is made of metal in those cases where the tubular portion is made of paper. In metallic shells base is a continuation of the shell. A percussion cap is fitted in the centre of the base separately, in almost all type of cartridge cases.

3. Cartridge cases may be belted, rimmed, semi-rimmed or rimless. In the first three types, the diameter of the base is larger than the diameter of the cylinder of the cartridge, while in the last one it is either equal or smaller.
4. The cartridge case may be cylindrical throughout, has a neck or the cylinder is tapered. The type is decided by the ballistics requirements.
5. The percussion cap is made of copper, brass or cupronickel alloy.
6. In rim-fired cartridges, not only the base is a continuation of the shell but there is no separate percussion cap also. The cap composition is placed inside the rim around the base. The function of the anvil is carried out by the turned edge of the rim.
7. The cartridge case carries the identifying data of the manufacturer, the calibre and the year of manufacture.

8.3.2.5 Wads

Wads are used in shotgun ammunition mostly. The wads in the shotgun cartridge are an over-shot wad under-shot wad, over-powder-charge wad and a cushion wad. The wads keep the various components of the cartridge in position. Some noteworthy points about the wads are:

1. Wads enter the body *en masse* from contact/near contact/powder ranges
2. The overshot wad fits tightly in the case, to keep the projectile charge in place, without rattling.
3. The overshot wad is kept in position by crimping the edges of the cartridge or by turning the edge inside.
4. The overshot wad is waxed to prevent the entry of the moisture in the cartridge.
5. Most of the wads shatter into pieces in their free flight
6. Cushion wad is made of felt or paper. It seals the barrel bore and prevents the escape of gases;
7. An innovation of great importance is power piston wad, which replaces the wads mentioned above. It is a single plastic structure consisting of three parts:
   - Rectangular sleeve
   - A cushion
   - An overturned cup, as overpower device.

The power piston wad has advantages over the conventional wads.

1. They seal the barrel and prevent the escape of gases from the sides; hence they ensure more kinetic energy to the projectiles.
2. The sleeve prevents deformation of the projectiles; hence more uniform pattern is obtained.

Fig. 8.11

Sectioned view of a modern cartridge wadding. The white outtline represents plastic cup, piston and sleeve

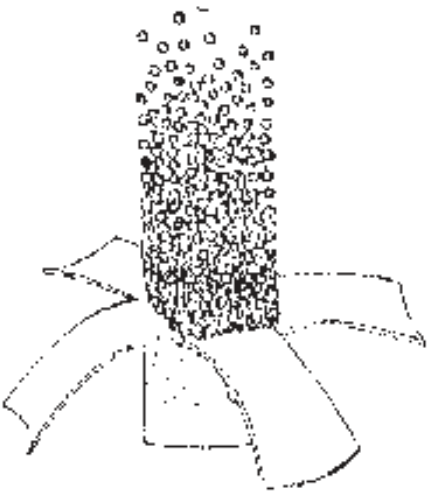

Fig. 8.12

Pellet protection sleeve opening up on firing

In rifled firearm ammunition, the bullet itself seals the mouth of the cartridge case. Sometimes a wad separates the bullet from the powder charge. The wad prevents seepage of the grease, placed in the cannelures, down to the powder charge.

The base, cylindrical surface and the top wad of a cartridge carry legends giving its calibre, type, year of manufacture, and its make, The information is ordinarily in abbreviated form. It differs with different makes. The information is often important.

In an important conspiracy case, it was necessary to establish the country of origin of the ammunition recovered from the accused. It was found that ammunition was manufactured during the Second World War by the British Government and could have come from the suspected country, (Pakistan). (CH)

8.4 THE FIRING PROCESS

When the trigger of a firearm is pressed, it releases the hammer or the striker with considerable force. The striker compresses cap composition, a pressure-sensitive material, contained in the percussion cap, by its impact. The material catches fire and gives out heat, which puts the propellant on fire. It is changed into gases quickly. The large volume of gases so produced develops high pressure. The projectile is forced out of the cartridge and is pushed through the barrel with considerable force. By the time it comes out of the barrel, it has acquired high velocity and moves towards the target.

The velocity of the projectile goes on decreasing with the increasing distance it traverses, mainly due to air resistance and force of gravity. They ultimately neutralize the forward motion of the projectile and it falls down to the ground.

If a target is met in between, the projectile strikes the target with a force due to its Kinetic Energy (KE), given by:

$$\mathbf{K\,E = \frac{1}{2} M\,V^2}$$

Here "M" is the mass of the projectile and "V" its striking velocity.

The transferred kinetic energy causes the destructive effect at the target.

A projectile coming out of a rifled firearm has two motions — translational motion (moving forward) and gyratory motion (angular spin). That is, while the projectile is moving forward, it is also rotating around its longitudinal axis. The spinning motion of the projectile reduces air resistance. The loss of velocity is, thus, slower and the trajectory is flatter. Consequently, the aim and range of projectile improve considerably.

The pressure developed in the cartridge is tremendous. It varies from 470 to 3200 kg per cm^2. It is transmitted equally in all directions. The backward pressure pushes the cartridge case backwards and sideway pressure expands the cartridge shell all around. The case, therefore, comes in close contact with the gun parts (firing pin, breech face, chamber and extractor). It picks up marks from the irregularities of the contact surface. The clarity of the marks depends upon the cartridge case, the tolerance allowed in the various parts of the firearm and the pressure developed in the cartridge.

In self-loaders and automatic firearms, either the recoil of the cartridge case or a small part of the expanding gases is allowed to leak backwards to push the cartridge case and the movable parts of the firing mechanism backwards.

An ejector is placed at an appropriate place. The cartridge case, in its backward motion, strikes the ejector and it is pushed out through a suitably located vent.

When the force of recoil/gases is spent, the firing mechanism, due to its spring action, comes forward to its original position. In its way, it picks up a fresh cartridge from the magazine and puts it in the chamber. The action stops here in self-loaders. The trigger must be pressed a second time to repeat the firing and reloading.

In automatic firearms, if the trigger is kept pressed, the firing pin is released after the cartridge is placed in the chamber. It hits/fires the cartridge. The whole process is repeated until either the magazine is exhausted or the pressure on the trigger is released.

Automatic and semi-automatic firearms throw out the cartridge cases at the scene of occurrence automatically. The position of the fired shell at the scene fixes the position/location of the shooter from where he fired the shot(s).

> *In a murder case, the eyewitness stated that there were two shots fired by the culprit from a semi-automatic firearm. The police had recovered only one fired cartridge case. Non-recovery of the second cartridge case weakened the prosecution case. (CH)*

In muzzle-loading firearms, the propellant is put into the gun through the muzzle. It is covered with some wad material. The charge is rammed in position with a ramrod. Likewise, the projectile charge is also put through the muzzle. They are covered with wads and rammed into position. A percussion cap is placed upon the nipple of the firearm, the hammer is cocked, and the firearm is ready for firing.

When the trigger is pressed, the hammer is released. It strikes the percussion cap, compressing the cap composition to give a flame. The flame reaches and puts the propellant on fire.

The powder residue, the torn percussion cap, the projectile charge and the wads form important clues in cases involving muzzleloaders.

8.5 THE PROBLEMS/POSSIBILITIES

The problems/possibilities in cases involving firearms relate to arms, ammunition, injuries, range of fire, time of fire, verification of version and sequence of events.

8.5.1 Firearms

The questions relating to firearms are:

1. Is the given device a firearm in accordance with the Arms Act?
2. Is the firearm in working order?
3. Is it liable to fire accidentally?
4. Has it been used? If so, when?
5. Was it involved in some other crime case(s)?
6. Has it been used as a bludgeon?
7. Can its erased serial number be resuscitation lead to its owner through
8. Has the firearm been tampered with? If so, what is the nature of tampering?
9. Is the firearm improvised or a factory-made firearm?
10. What are the make, model and calibre of the firearm?

8.5.2 Fired Ammunition

The following information is sought about fired ammunition:

1. Was the given fired ammunition fired from the suspect firearm?
2. What are the calibre, make and model of the firearm from which it was fired?
3. Was the recovered fired ammunition fired from one or more firearms?
4. Is the given fired ammunition similar to the live ammunition recovered from the suspect?
5. Is the recovered fired ammunition from the suspect and that from the scene, fired from the same firearm?
6. How many lands or grooves are there on the bullet?
7. What is the direction and pitch of the twist?
8. What are the widths of the lands and grooves?
9. What is the depth of the grooves?
10. Is the firing pin mark on the missed cartridge identifiable in respect of the given firearm?
11. What is the size of the given fired pellets or buckshot?

8.5.3 Firearm Injuries

The injuries provide information on the following points:

1. Are the given injuries gunshot injuries?
2. If so, what type of firearm/ammunition caused the injuries?
3. Are the injuries from one or more than one firearm?
4. Are the injuries suicidal, accidental or homicidal?
5. What was the range of fire from which the given injuries inflicted?

8.5.4 Medico-legal Problems

The medico-legal expert, who performs the post-mortem examination, in a shooting case, may have to answer the following questions:

1. Did the victim die of gunfire or did he die of some other cause?
2. Are the injuries on the deceased the result of gunfire? If so, what type of firearm(s) and ammunition were used?
3. How old are the firearm injury?
4. Is the given injury an entrance or exit wound?
5. What was the range of fire to cause the injuries on the victim?
6. How long could the victim survive after the give (fatal) injury?
7. Could the injured perform the acts attributed to him after the injury?

Note.—**Medico-legal and firearm experts should answer the questions (2) and (5) conjointly.**

8.5.5 Muzzleloaders' Problems

In muzzle-loading firearms the information sought is:

1. Were the recovered percussion cap(s) fired from the suspect's firearm?
2. Were the recovered lead shots from the victim cast in the mould recovered from the suspects?
3. Were the shots recovered from the victim and the accused prepared in the same mould?
4. Did the shots recovered from the victim carry identifiable barrel or ramrod marks?
5. Was the lead (or lead shots) recovered from the body and from the house of the accused, from the same source?
6. Do the wad materials, paper or rags, recovered from the scene (or from the victim) match with similar material recovered from the accused?
7. Does the gunpowder/GSR found at the scene or on the body of the victim and the powder recovered from the accused come from the same source?

8.5.6 Live Ammunition

Sometimes live ammunition figures as evidence. Its evaluation can answer the following questions:

1. Is the given material ammunition in the legal sense?
2. What are the calibre, nature, and make of the given ammunition?
3. Is the given ammunition fire-worthy?

8.6 LOCATION OF EVIDENCE

The main sources of firearm evidence are:

1. The victim
2. The culprit

3. The scene of occurrence
4. The firearm
5. The ammunition
6. Disposal site of the firearm/ammunition

8.6.1 The Victim

The firearm evidence, in shooting cases, on the person of the victim is substantial and significant. The important pieces of evidence are:

- Injuries
- Projectiles
- Bullet holes in clothes
- GSR deposits
- Close range firing phenomena
- Direction of fire

8.6.1.1 Injuries

Injuries provide a lot of information. The IO carries out the inquest. However, most of the examination of the body is perfunctory. It should be thorough, so that he can detect the failure of Medico-legal expert, if any, due to negligence or otherwise.

An IO is not a medico-legal expert, he may find it difficult to locate firearms injuries, especially when small calibre projectiles at low velocity have caused the injuries at the site not easily noticeable (mouth, ear, or other body orifices). It is also difficult to locate if it is small calibre projectile head injury. Medico-legal expert is the person to locate them. The IO should get complete details from the expert.

The injuries provide a lot of information including:

1) **Muzzle impression;** around the entrance hole, indicates it was a contact shot. The firearm was pressed at the site. It also indicates the type of firearm.
2) **The trajectory** (path), of the projectile in the body of a victim provides significant information: It helps to:
   - Ascertain whether the projectile was a high, medium or low velocity projectile.
   - Ascertain if it was the cause of death.
   - Determine the range of fire.
   - Discover the direction of fire.
   - Ascertain whether there was some intermediate target.
   - Indicate whether the injury or injuries are ante- or post-mortem injuries (bleeding pattern!).

In a case of alleged suicide, the only entry wound was a 12 bore shotgun injury on the left side of the neck from a close range. The exit wounds were a cluster of five wounds in a diameter of about three centimetres; on the lower part of the left shoulder. The two injuries indicated the direction of the shot. It indicated that the gun muzzle and barrel must have been held at an angle of 70-80^0 to the shoulder line. No other position of the gun could be visualized. The victim could not hold the gun in that position and fire the shotgun to create the injuries. The trigger of the gun was far too high, and the heavy gun could not be kept steady for firing! Obviously, it was no case of suicide; the person was murdered. (CH)

3) Damage to the body tissues

The extent of damage due to a firearm injury helps to:

- Find whether the shot incapacitated/killed the victim.
- Ascertain if the victim could perform the allegedly performed acts by the victim.
- Fix the quantum of compensation in non-fatal accidents.

8.6.1.2 Extraneous Materials

The victim may carry GSR, bullets, balls, slugs, pellets, wads (and/or their fragments) and sometimes material from the intermediate target, in the body. They help to:

- Link the criminal and the crime.
- Determine the nature of the arm/ammunition used to kill the victim
- Establish the range of fire.
- Indicate the intermediate target

8.6.2 The Culprit

The culprit carries important incriminating evidence:

1. **Propellant and primer residues;** they are deposited on the culprit's hands, arms, hair, face, and clothes. The deposits establish that the culprit had fired a firearm. The deposits on hand also help to ascertain whether he is left/right hander.
2. **Glass fragments**; if a culprit has discharged a firearm through a glass pane (windowpane) from close range, the blow-back glass particles fall on the culprit including on his clothes, shoes. They can connect the culprit with the crime scene and crime.
3. **Pocket dust, fluff;** Sometimes the culprit carries a firearm in his pocket; the firearm picks up dust/fluff from the pocket. If a culprit leaves/throws the firearm at the scene after the commission of the crime and it is found by the IO, the dust/fluff can link the culprit with the firearm.
4. **Previously Fired Ammunition;** a culprit may destroy the firearm after the commission of a crime. If the house and the hideouts of the culprit are searched, previously fired ammunition is recovered sometimes. This fired ammunition and the incriminating evidence, recovered from the victim/scene may indicate the use of the same firearm. The evidence, thus, links the criminal with the crime like the recovery of firearm itself.

   In a murder case, no firearm could be recovered from the suspect. However, on search, some previously fired cartridge cases were recovered from the suspect's house. The two sets of the fired cartridges were found to have been fired from the same firearm. The suspect was linked with the scene/crime. (CH)

The location and collection of previously fired cartridges and bullets should also be useful in cases where the culprit has damaged (or tampered) the firearm. The tendency to do so is increasing. If the fired ammunition recovered from the house of the suspect and the ammunition recovered from the victim or from the scene is found to have been fired from the same firearm, the presumption of guilt becomes even stronger especially if the tampering with the firearm is also proved.

In an interesting case of a gang war, the leader of one gang was killed. The members of his gang were the eyewitnesses. They alleged that they were attacked while they were running away

from the killer gang. They had no firearms and did not give any fight. However, there were recoil injuries on the left hand of the deceased. The injuries were such that they could be caused only if the victim had held a firearm loosely and fired. The injuries proved that he had a firearm and he fired the firearm with his left hand.

The evidence of recoil was irrefutable:

1) *There was blackening and tattooing on hypothenar and thenar region. The presence of blackening and tattooing indicated, beyond reasonable doubt, that he had fired a firearm with his left hand, which caused the blackening and tattooing at the sites, which is apparently from the smoke which comes from the chamber end.*
2) *There were injuries on his left hand (on the hypothenar region, distal phalange of the little finger and thenar eminence). They were lacerated wounds only and were not caused by projectile(s).*
3) *The presence of these injuries and GSR clinched the thesis that the victim had fired a handgun and thus, had given fight in the gang war.*

Fig. 8.13

The lacerated region coloured (schematic)

The position of the handgun held in the left hand is illustrated in the figures below. The arrowheads indicate the sites of contact on the left hand and the sites of recoil injuries. The deceased victim must have fired the firearm holding it loosely. The recoil of the firearm lacerated the injured sites.

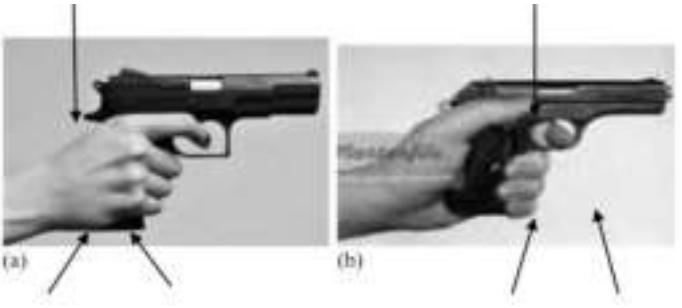

Fig. 8.14

The holding of the firearm to cause the given recoil injuries:
a. Exterior view of the hand and the affected parts b. Medial view of the hand

The injuries were not projectiles injuries, because:

- *Injuries were close to each other. No shooter, under the circumstance of the case, could achieve so close a group of injuries, even if he wanted to.*
- *There were no projectiles embedded in the hand.*
- *There were no punctured/tear wound(s) which were inevitable if they were caused by projectiles.*
- *Injury sites corresponded to the contact sites when a handgun is held and fired.*
- *The force of recoil is equal and opposite to the force with which the projectiles go forward (**To every action there is equal and opposite reaction**). This force moved the firearm violently and injures the hand.*
- *The severity of injuries depends upon the recoil force and the looseness with which the firearm is held.*
- *In short, injuries on the left hand of the deceased were due to recoil of the handgun, which was held loosely at the time of firing***.**
- *The version of the gang that they had no firearms, did not give any fight and were fired at from behind when they were running away from the killers, was false. (CH)*

8.6.3 The Scene of Occurrence

> You get only one chance to process scene. Delaying/mishandling/ non-protection can lose a plethora of evidentiary clues.
>
> **("now or never!")**

A shooting incident scene is an important repository of evidentiary clues. It needs immediate thorough/meticulous processing to search/locate/collect them. The evidence is varied and includes:

1) **Firearm;** the presence of a firearm itself is important evidence in alleged suicide/ accidental firing cases, the position of the firearm is important to ascertain the validity of the plea. The firearm may be in the hands of the person who has committed suicide, or it may have fallen close by. Elaborate arrangements are necessary if the firearm is to be fired from a distance.

   In an interesting case, the firearm was found in the right hand of the victim, whereas, the victim was known to be left-handed. Homicide rather than suicide was, therefore, suspected. The investigation confirmed the suspicion. (CH)

2) **Fired cartridges**; they are often found at the scene of occurrence. In semi-automatic/ automatic firearms, the ejector throws out the fired shell at the scene automatically, after each fire.

   The position of the fired cartridge, in automatic/semi-automatic firearm firing, the position of the culprit, at the time of firing, is also fixed. The cartridge cases are thrown out in a definite direction to a definite distance. It thus also indicates the range of fire.

   In non-automatic firearms, the culprit often reloads his firearm and leaves the fired cartridge(s) at the scene.

   Theoretically, the culprit can and should take away the cartridge cases. But in practice, it seldom happens. The emotional disturbance and the urge to leave the scene at the earliest, usually, prevent the culprit from taking away the fired cartridge cases.

3) **Projectiles;** the projectiles sometimes are embedded in the walls, doors, furniture, trees and ground at the scene. The sites are carefully examined, and projectiles recovered. The positions of the projectiles/their marks help in the reconstruction of the crime.

In a multi-murder case, it was alleged that the culprit killed the victims after tying them to a tree. The stump of the tree was examined. No bullets, their fragments or even their marks could be discovered on the stump of the tree. The version of the complainant was false. (CH)

4) **Wads;** shotgun cartridges contain wads. When a shotgun is fired, wads and/or their fragments fall at the scene; unless they are found inside the body of the victim/inside the target. Their positions help to establish the direction and the range of fire and help in the reconstruction of the occurrence.

5) **Marks;** bullet dents and ricochet mark on doors, windows, walls, floor and furniture help to reconstruct the occurrence.

Fig. 8.15

Scene after the removal of victim

8.6.4 The Firearm

The firearm itself is an important piece of evidence. The criminal does not leave it at the scene unless he plans to show the crime as a suicide or an accident. The make and model type, serial number, its firing capacity, calibre and barrel length, are recorded.

The firearm is often recovered from the culprit or from his house. He may have, however, hidden, destroyed or thrown away the same. In the latter cases, the investigating officer should

put himself in the role of the culprit and follow the route of the culprit's departure from the scene. He should check all likely places where the firearm could have been disposed of conveniently without attracting attention. Trained police dogs also help to locate the firearm.

The recovered firearm provides varied evidence:

1. **Linkage;** it links the criminal with the crime through the identification of fired bullets/cartridge cases recovered from the victim or from the scene.
2. **Fingerprints;** the recovered firearm may carry fingerprints. It is handled carefully to prevent their mutilation. Fingerprint expert processes them.
3. **Gunshot residues;** gunshot residues are found in the barrel of a firearm and on the firing mechanism. They help to establish the approximate time of fire.
4. **Rust and dust**; the presence of rust or dust in the barrel indicates that the firearm has not been used for some time. It can, thus, eliminate some suspected firearms and consequently their owners.
5. **Blood, flesh and skin;** the firearm may carry blood, flesh and skin from the victim. It often happens in contact shot firing. The materials, Via DNA, establish a definite link between the victim and the firearm (and the owner of the firearm).
6. **Identity of Firearm;** a factory-made firearm has manufacturer's name, logo and a serial number engraved on it. They help to locate the owner.

The criminal sometimes erase/mutilate the engraved identifying data. Resuscitation of the mutilated data, usually through chemical processes reveals the same.

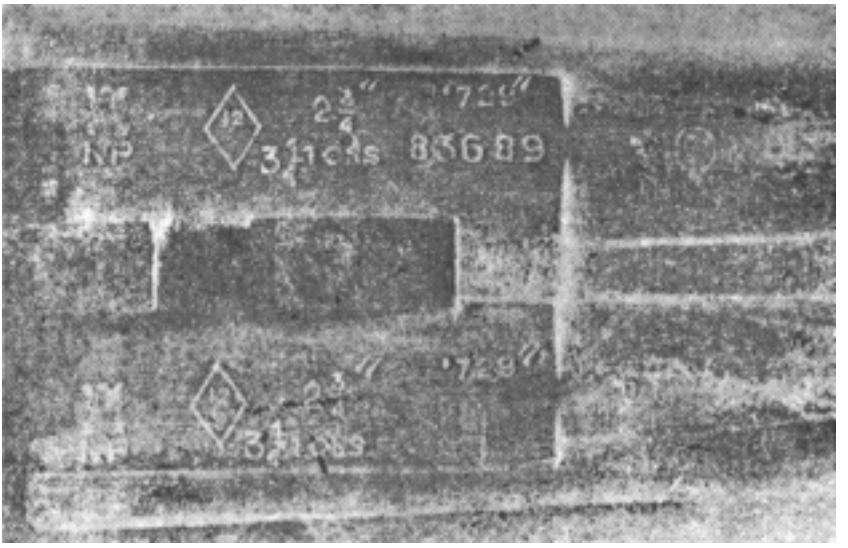

Fig. 8.16

The serial number and other identification marks on a 12 Bore DBBL gun

A few years ago, a firearm was received in the laboratory to decipher its erased serial number. Resuscitation of the number connected two murders.

The firearm had been taken from a police officer after killing him. The murder had remained untraced till then. (CH)

Firearm reports and flashes sometimes figure in criminal cases. However, a definite opinion about them is not yet possible. Research is going on in this field.

8.6.5 The Ammunition

The live ammunition has forensic importance. It provides the right material for test purposes. It is recovered, ordinarily, from the house of the accused. In case the culprit has spent all, the source of ammunition for test purposes is the arm and ammunition dealer from whom the culprit purchased the ammunition.

Fired bullets and cartridge cases are recovered from the victim or from the scene. They carry thumbprint of the firearm, which fired them. Thus, they link the criminal, from whom the weapon is recovered, with the crime.

Fired ammunition (cartridge cases) at the scene of occurrence occasionally may carry fingerprints of the culprit. They are of great evidentiary value.

8.7 COLLECTION

IO at Shooting Scene (Nutshell)

1. Provides medical assistance to the injured
2. Frames investigative strategy
3. Ensures safety of the investigating team
4. Preserves, protects, documents/records the scene (videography, photography, sketching, textual notes)
5. Detains suspects, arrests culprits, segregates witnesses, collects intelligence about absconder(s)
6. Locates, collects, preserves, packs, seals and despatches the physical evidence present at the crime scene/with the culprit/victim/vehicle/weapon/intelligence people
7. Attends post-mortem examination, to get comprehensive medical data about the deceased and the complete injury profile
8. Utilises all the resources at his disposal (and more) in investigation
9. Keeps the seniors informed about the progress
10. Releases the scene only after he has finished with it
11. Follows the law and the departmental rules
12. Records the basic data:—
    - His Arrival time at the scene
    - The weather conditions at the scene
    - The state (condition) of doors/windows/ventilators/bathrooms/taps**.**
    - Any oddities at the scene, characteristic odour?
13. Records the action taken at the scene

The investigating officer plays a crucial role in furnishing firearm evidence in shooting cases. He collects:

8.7.1 Firearm

The firearm may carry fingerprints, fibres, blood, flesh, hair or any other extraneous material. Or, it may be loaded and may go off while being handled and thus prove fatal to the investigating officer or person standing nearby. The investigating officer, therefore, while collecting the firearm, should:

1. Ascertain whether the weapon is cocked or not, its safety catch is on or off, the firearm is loaded or not. He records the state and takes action to make the firearm safe for handling.
2. Handle the firearm in such a way that even if it goes off it does not injure anybody by ensuring that nobody faces the muzzle of the firearm.
3. Consider the firearm safe only when he can see through the barrel and the magazine, if any, is detached.
4. Hold the firearm from a place so as not to destroy the existing evidence (like fingerprints), nor any new evidence is introduced. The firearm is held from the sling, ring, trigger guard or from the corrugated surfaces on the butt.
5. Search for extraneous evidence like hair, fibres, bloodstains, skin, flesh, paint or dust. These items may not be adhering to the firearm firmly and may get lost. They are, therefore detached and packed in small separate cellophane pouches before the firearm is processed for fingerprints.
6. Avoid touching the inside of the barrel. The presence or absence of rust, fouling, dust, skin, flesh, blood and other materials can lead to important conclusions. If anything is introduced in the barrel, the evidence is contaminated, mutilated or lost. He caps the barrel.
7. Check the breech face of the firearm. It may bear marks in dust or grease. He photographs them.
8. The breech face may carry enamel or paint from the cartridge fired through firearm. The materials help in the identification of the cartridge.
9. Avoid carrying the firearm in a pocket or in a dirty or dusty container. It is likely to introduce dust or dirt in the barrel, which can mislead the expert.
10. Put identification marks (case number, initials with date) and get signatures of the witnesses on the firearm. The signatures are put at a prominent part like barrel, action block or stock and not on an interchangeable part.

    The detailed particulars (FIR No. with date, and name of the police station) are scratched on the firearm, at a place where there is no evidence.
11. Place it in a cellophane envelope if it is a handgun. The envelope is put in a box with clean rags or cotton wool padding, so that the firearm does not rattle inside. It is then packed, sealed and dispatched to the laboratory with usual formalities.

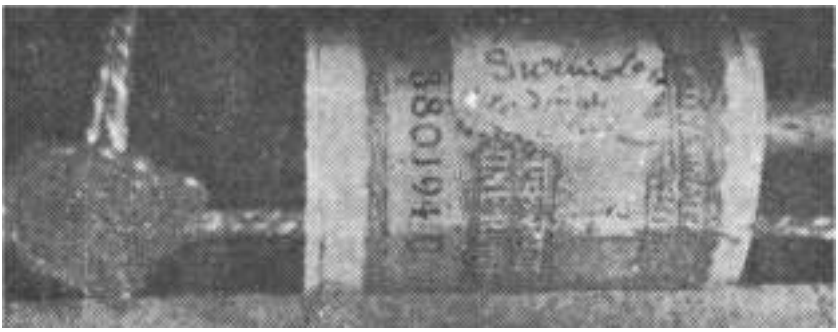

Fig. 8.17

Sealed and signed chit (one rupee note with serial number!) fixed on a gun. The gun is not properly sealed. it should be covered with a cloth after placing in a cellophane sheet

12. Take exhaustive notes to:
    - Record the positions of the firearm with respect to other articles at the recovery site. Sketches and photographs help.
    - Indicate the conditions whether the firearm was loaded or not, whether the safety catch was on or off and whether the firearm was cocked or not. In the case of a revolver, he indicates the position of the fired and live cartridges in a sketch.
    - Record the nature, quality and quantity of the extraneous evidence discovered and recovered.
    - Record the make, serial number, proof marks, decorative designs, the dimensions of the firearm and its important parts, especially if there is any peculiarity in design, construction and mechanism.
    - Record the source of the seal, if it is not the seal of the investigating officer and the number of seals put on the parcels. He keeps a specimen impression of the on the file. Another impression is sent to the expert.
    - Record the addresses of the witnesses.

In addition, he observes, scrupulously, the instructions given on documentation of the scene in the chapter on "***Scene of Occurrence***" of this book.

8.7.2 Cartridge Cases

While collecting cartridge cases, the investigating officer should:

1. Detach any extraneous matter adhering to it without mutilating fingerprints, if any, and collect the same in the usual way.
2. Preserve fingerprint, if any.
3. Initial the cartridge case, preferably inside, with a pin.
4. Record the legend found on the cartridge case in the case diary.
5. If more than one cartridge is to be packed in the same box, put each cartridge case in a cellophane envelope and pack these envelopes in a box with sufficient padding to avoid rattling.

8.7.3 Bullets

The medico-legal expert extracts bullet(s) from the body of a victim. The IO also recovers them from furniture, wall, floor, at the scene. He sometimes finds them entangled in the clothes of the victim or lying at the scene. The bullets are often found damaged. They brook no further mutilations if they are to be useful in the delivery of justice. Therefore, they need careful handling in the extraction process and putting identification marks on them.

The Medico-legal experts extract bullets from dead bodies. They take care to:

1. Establish the exact location of the bullet through X-rays.
2. Extract the bullet with hands covered with rubber gloves, whenever possible
3. Cover the tips a pair of forceps with rubber/plastic covers, if it has to be used. It avoids/reduces damage to the striations existing on the bullet.
4. Avoid prying out a bullet from its seat, if it is embedded in bone. He cuts the piece of bone containing the bullet and breaks the bone in such a way that the bullet is not damaged in the process.
5. Put identification marks (initials) on the base or on the tip of the bullet. The surfaces do not carry marks.

In a multi-murder case, one of the pleas of the defence for acquittal was that the Medico-legal expert, who had extracted the bullets and their fragments from the dead bodies, could not identify them at the time of giving the evidence. The doctor had not put any initials on the bullets. (CH)

The investigating officer collects the bullets found in furniture, wall, wood, floor or earth. Whenever possible, he should send the original article containing the bullet to the expert.

The bullet may carry traces of sand, paint, wood or fibre when it has ricocheted. The traces can be detected through microscopy, they must be protected properly.

8.7.4 Slugs and Shots

Slugs, shots, pellets, wads and powder residues often figure in criminal investigations. These articles are marked individually for identification purposes whenever possible. The slugs, shots and pellets may carry identifiable barrel marks sometimes. While extracting them from the body of the victim/or elsewhere, care is taken to prevent damage to the marks, as in the case of bullets.

8.7.5 Clothes

The clothes often carry GSR and projectile holes. In their collection, care is taken to:

1. Dry the clothes before packing if they are wet.
2. Protect the marks with a cellophane sheet. The sheet is fixed (attached) with an adhesive tape/adhesive.
3. Put the identification data (name of the owner, the date of recovery, the case identification marks, initials) on clothes at a place, which is free from evidential clues.
4. Pack the clothes in sturdy dust-proof paper bags.

8.7.6 Live Ammunition

A whole lot of the live ammunition found with the suspect is collected and dispatched to the forensic science laboratory through a special messenger observing all formalities. It is properly packed, labelled and handled to avoid accidental explosion due to friction or other causes.

8.7.7 Glass Fragments

Tiny glass fragments are difficult to collect from the clothes/shoes. They, therefore, should be sent to the laboratory as such. The laboratory staffs know how to collect them.

If the IO has collected the glass fragments, he places them in a glass vial or in a clean small envelope and dispatches them to the laboratory in the usual way.

8.7.8 Gun Shot Residues (GSR)

GSR is deposited in the hands of the shooter (culprit/a suicide). The suspect is taken to the nearest forensic science laboratory, if possible. Or, the services of a Forensic expert are requisitioned. Alternatively, the discharge residues are collected as under:

1. Molten wax of appropriate melting point is deposited slowly until about two-millimetre-thick layer is formed on the hands of the suspect. The cast is peeled off. The cast is placed between two inflexible plastic/glass sheets. They are held together with adhesive tape or cement. It is packed and forwarded in a suitable cardboard box.
2. The hands of the suspect are swabbed with clean surgical cotton wool dipped in dilute acetic acid, hydrochloric acid or nitric acid (5%). The dilute acids dissolve the discharged residues. The solution along with the swab is put in a clean glass vial. The vial is properly corked, packed and forwarded.
3. Adhesive tape, collodion solution, and cellulose acetate solution are also used to lift powder residues from hand.

8.7.9 Injuries

A medico-legal expert, who performs the post-mortem/medico-legal examination, examines the injuries. In certain cases, a firearm expert joins the medico-legal expert team. He helps to collect correctly the foreign materials (projectiles/wads/GSR,) in/on the body and to assist the team in the evaluation of the injuries. He is also able to know the nature/damage/angle of fire/range of fire from the injuries.

Post-mortem/medico-legal reports provide complete/correct details. They are illustrated usually through sketches/diagrams/photographs (taken along with scale).

If the firearm or the ammunition or both have been recovered from the suspect, they are sent to the laboratory along with other documents.

8.7.10 Bullet Holes

The original articles, bearing the bullet holes, dents, or other marks are collected whenever possible. The scaled sketches and photographs showing the details of the marks, their positions on the item and also the position of the article are sent only when the article cannot be transported to the laboratory. They are poor substitutes.

The expert should visit the shooting scene in important cases. Direct visual examination of the scene permits a better appreciation of the evidence.

8.7.11 Test Exhibits

The expert himself prepares the test exhibits. The investigating officer should not fire and send cartridge cases, bullets and test patterns to the experts.

The best test materials are the same firearm arm and similar ammunition. The recovered ammunition (and firearms) are therefore, sent to the laboratory.

8.8 EVALUATION

The identification of fired cartridges, bullets and balls, in respect of the firearms used to fire them, is the most important evaluation in forensic ballistics. Like fingerprints, the identifications are definite: positive or negative. The following principles and procedures are involved in the work:

8.8.1 Principles

8.8.1.1 Unique firearm marks

The firearms imprint unique and individualistic marks on fire cartridges/bullets and other projectiles.

The parts of a firearm that come in contact with cartridges on firing, are firing pin, breech face, extractor, ejector and the chamber. They leave indentation marks on the fired cartridges.

Likewise, the barrel of a firearm scratches a tightly fitting projectile when it passes through the barrel. Scratches create striations (lines).

Both indentations and striations have unique (individualistic) profiles, because:

- These parts are made of hard metal/metal alloy (steel) by cutting, hammering, filing, reaming and polishing. The processes leave unique surface patterns.
- The functional surfaces of the tools used, continue to change because of wear and tear and accidental damages they suffer due to working on harder metal/alloy.
- The application of these tools in their manufacture, to create these parts, involves mostly random motion.
- The finished surfaces of the relevant parts of all firearms are, therefore, never alike even when the two firearms (and their surfaces) are created with the same set of tools, one after the other. Consequently, all firearms, even the two barrels of a double-barrelled firearm, show a complete individual pattern of the indentations/striation they leave on the fired cartridge cases/projectiles.
- The individuality of each firearm has been established by actual experiments carried out in the initial stages of the development of this science.

  A long barrel was bored and grooved with the same set of tools. It was then cut into six pieces. The six barrels thus obtained were fitted to six handguns. The bullets fired through the six barrels were correctly identified in respect of the individual barrel of the six firearms.
- With the use/abuse of the firearm, the wear and tear and accidental damage further enhance the irregularities of its surfaces.
- When a cartridge is fired, the irregularities (nicks and corners) of the surfaces come in close contact (under pressure) with the cartridge case or on the bullet and imprint their patterns on them. These patterns are so individualistic, like fingerprints that some experts call them as the thumbprints of the firearms. They provide definite firearm-cartridge/bullet linkage or elimination.
- The cartridge cases and bullets are, ordinarily, made of comparatively softer materials than the material (steel) of the firearm. The marks producing surfaces, therefore, do not change substantially for thousands of shots and the fired ammunition can be identified even when the firearm is recovered after a long interval.
- If the firearm is ill kept, misused or intentionally tampered with, the surface characteristics change. The fired ammunition may or may not then be identifiable after the change; depending upon the changes made in the firearm surface. Each case has to be decided by actual experiments.

In a murder case, the firearm was buried underground for many months. After careful cleaning test bullets were obtained. It was possible to identify the crime- bullet by comparing the same with the test-fired bullets, in spite of the fact that the firearm had rusted extensively from outside. (CH)

In another case of murder, the culprit got the firing pin replaced from a machinist immediately after the murder. He paid for the services and got a receipt for the same.

After some time, the police seized the firearm and sent it to the laboratory along with the cartridge case recovered from the murder scene. The expert linked the cartridge to the firearm.

The defence counsel argued that the cartridge could not have been fired from the weapon as the vital part of the weapon (the firing pin) had been replaced after the date of the occurrence of crime!

The prosecutor and the judge were perplexed. The court called the expert.

The expert informed the court that the firing pin marks on the test and the crime cartridge case did not correspond. It meant that the firing pin had been replaced (as suggested by the defence). But the breech face marks on the crime and test cartridges provided ample evidence to show their common source of origin. The photographic illustrations convinced the court.

Fortunately, the trickery (fraud) of the culprit did not succeed! (CH)

- Sometimes a very old firearm is used in the commission of a crime. Due to extended use over long periods, the barrel of the firearm is "washed" and its bore becomes larger. A bullet fired through such a firearm barrel does not "house" properly. The bullet may/may not pick up identifiable marks – the thumbprint of the firearm. Ordinarily, this does not happen during the interval between the commission of the crime and recovery of the firearm used in criminal cases.
- Some criminals use previously fired bullets in cartridges of a higher calibre. For example, 32 fired bullets is placed in a 12 bore cartridge and fired. This misleads the investigating officer. He searches for a rifled firearm rather than a shotgun. It complicates the investigations.

A few years ago, a culprit shot and killed a man with a 12-bore shotgun. He was caught "red-handed". He admitted the firing before the police and handed over the gun with a cartridge case in its barrel.

At the time of post-mortem, the doctor recovered a fired projectile from the body of the victim. But nobody bothered to notice its nature. In the trial, the culprit pleaded false implications and got acquittal because the projectile recovered from the victim was fired from a rifled firearm. Presumably, the culprit had put a fired bullet in the shotgun cartridge. (CH)

4. If a cartridge of lower calibre is fired through a firearm of a higher calibre, its bullet does not fit in the barrel and often does not take identifiable marks. If some marks are discovered on the bullet, they are compared with fired test bullets of the correct calibre (corresponding to the firearm). In some such cases, the test bullet of the right calibre does not give correct comparable marks. In such situations, a lead bullet or a slug (specially prepared) of slightly larger diameter than the bore is pushed through the barrel. It takes up most of the marks from the barrel and provides useful test material for comparison in some cases.

8.8.2 Class and Individual Marks

The position, size, shape and depth of firing pin, breech face, extractor, ejector and chamber marks on a fired cartridge case constitute class characteristics while finer details in the marks give the individual features of the firearm.

Similarly, the number/ width/depth/direction and pitch of the lands and grooves on a fired bullet indicate class characteristics of a firearm while finer details in the lands and grooves are individual characteristics of the firearm.

Class characteristics are common on the ammunition fired from firearms of the same make and model, but they differ with different makes and different models of the same make. Individual features are so named because they are always different, and no two firearms have the same characteristics.

The class characteristics are useful in quick eliminations of some suspected firearms. The nature of a firearm and possible make is indicated by the class characteristics. This indication is useful when the firearm is not recovered immediately and there are a number of suspects.

8.8.3 Test Exhibits

The identification of fired ammunition is always carried out by comparison of marks with text exhibits. Ordinarily, two test cartridges are fired. However, in the case of some firearms even one cartridge may be sufficient. In certain high-grade firearms, the marks are not clearly imprinted, when even a dozen cartridges may have to be fired. The number of test cartridges is not material. The limiting factor is only the clarity of the marks. If clear marks are obtained on the first cartridge, it is not necessary to fire a second cartridge. Formerly, it was suggested that a number of cartridges should be fired, and the test exhibits be studied *inter se* to establish the thumbprint of the firearm. It is no longer necessary because the individuality of each firearm is established/accepted by all concerned. The following aspects are kept in view:

8.8.3.1 Ammunition

Ammunition of the same make and batch is used for test purposes, whenever possible, though it is not necessary and not always possible. Ammunition recovered from the suspects, if any, is often used for test purposes, if it is of the same make.

8.8.3.2 No Firearms

In case no firearm is recovered (no gun work!) from a suspect, but fired ammunition is recovered from him or from his residence, the same is used for comparison purposes. They may provide definite linkage/de-linkage *inter se.*

8.8.3.3 Defective Firearms

It may not always be possible to fire a fully loaded cartridge, for test purposes, with a defective firearm. Some of the charges is removed in such cases. If the questioned exhibit is a cartridge case, the projectile charge of the round is removed. If a bullet is the questioned exhibit, the powder charge is reduced to about one-half to one-third.

8.8.3.4 High Velocity Rifles

In high velocity rifles, it is inconvenient to recover a bullet when a fully loaded cartridge is fired. The powder charge, therefore, is reduced to about one-half to one-third.

8.8.3.5 Damaged Firearms

In some cases, the crime firearm is so much damaged that it cannot be fired to get test exhibits. In such cases, the cast of the relevant impacting surface is prepared and compared with the

crime fired ammunition. Silicone polymers are considered most suitable materials. Cellulose acetate solutions have been in use for a long time

If the crime exhibit is a bullet, a test bullet is obtained by pushing a bullet of the same calibre through the barrel. Usually lead bullets are used for test purposes.

> *In a case of dacoity and murder, the firearm was so damaged that no test cartridge could be fired. A bullet, extracted from a cartridge, was pushed through the barrel. It provided an excellent match. (CH)*

8.8.3.6 Recovery

When only a cartridge case is the crime exhibit, the projectile charge is not collected. The test cartridges are fired at a firing range and the cases are collected.

For the recovery of projectile charge, a number of materials and devices have been suggested and used. A bullet recovery box, however, has been found simple, convenient and safe. It is a box about 2 metres long and about 25 centimetres square in cross-section. It is open from one side through which the projectiles fired. It is divided into five to six compartments, which are filled with clean cotton waste. The upper plank forms the lid of the box.

A test bullet is obtained by firing a similar cartridge in the recovery box. The bullet due to spin, forms a ball of cotton around it and is stopped at a short distance. The cotton ball protects the marks from damage/mutilation.

In place of cotton, rags, water, soap and paraffin have also used as the stopping media. They do not appear to offer any advantage over the cotton waste bullet recovery box.

Pellets and buckshot are recovered in a water drum with a false conical bottom. The shotgun is fired at the top. The shots travel through the water. By the time they reach the bottom they lose their kinetic energy/velocity. They collect at the bottom, from where they are recovered.

8.8.3.7 Cleaning

The bullets and cartridges are cleaned before they can be examined and compared. Dust and dirt are removed with a cotton wool swab. The grease from the surface is cleaned with benzene. Dilute acetic acid and dilute hydrochloric acid are also used to clean the surface.

If the surface of an exhibit is highly reflective it cannot be conveniently examined or compared. The surface is dulled by smoking it over burning magnesium. A thin coat of magnesium oxide is deposited which decreases the reflectivity of the surface appreciably. Glare is reduced by using a polarizer filter.

8.8.4 Examination

The visual examination allows quick eliminations and thus save a lot of time in cases involving a large number of firearms. It gives the position, size and depth of the firing pin, breech face, extractor, ejector and chamber marks. Sometimes there may be gross characteristic indentations, which permit quick identification or elimination of a suspected firearm in respect of a cartridge case.

Visual examination of bullet indicates the calibre, the number of lands and grooves, their depth, width, direction and twist. Visual examinations of these class characteristics make it possible to eliminate some firearms easily. Positive identifications, however, are rare.

Visual examination is carried out with ordinary light, being thrown at different angles.

8.8.5 Stereoscopy

Stereoscopy offers a 3-dimensional image of a mark. It reveals details more vividly. In fact, stereoscopic examination alone can provide positive identification of the cartridge case exhibits.

Test and crime cartridge cases are placed side by side (or one after the other). Spotlight lamps are used to illuminate them properly. The light falls on the two cartridge cases at the same angle.

The examination is started with the lowest magnification of the stereomicroscope and it is increased progressively. At higher magnifications, the cartridges are examined in turn because both are not covered in the field simultaneously. The cartridges are rotated through 360°. They are tilted, if necessary.

Stereoscopic examination of bullets may give positive identifications in some cases, not in all cases. The examination, however, always facilitates the comparison. It gives the idea as to what should be looked for in the comparison microscope.

8.8.6 Comparison Microscope

A comparison microscope is the ideal instrument to compare striation marks on bullets/ cartridge cases. Comparison work is best carried out with a. The instrument is in fact a combination of two microscopes, with identical optics. Here the images formed by each microscope are brought to focus in the same eyepiece through prisms.

A comparison microscope has arrangements for photography. Thus, the match found visually is recorded photographically for presentations, in a court, if required.

The instrument has mechanical stages. They allow up and down, and left or right movement of the exhibits. The stages can be rotated through 360°. It can be tilted if required.

The exhibits are illuminated by spotlights with arrangements for adjusting height, angle and the intensity of the illumination. Some makers provide a single fluorescent tube light lamp. Others provide two-lamp arrangement or both.

Fig. 8.18

An excellent striation match

8.8.7 Comparison Camera

Comparison camera is another device to compare marks on two entities. The instrument and working with it is cumbersome. Besides, it does not offer any advantage over a

comparison microscope. In fact, it is inferior in many respects. It is not used in professional work.

8.8.8 Striagraph

Striagraph is another instrument to study and compare the striations on projectiles or on other objects. The instrument does not offer any advantage over the comparison microscope. In fact, it has many drawbacks. It is not used for casework in Forensic Science laboratories.

8.8.9 Periphery Photography/Camera

A periphery camera is also known as strip or peripheral camera. It creates a two-dimensional image from a three-dimensional object surface. For example, the marks on the cylindrical surface of a bullet are captured on a 2-dimensional plane through a periphery camera (also known as strip or peripheral camera) on a plain sheet of film.

The periphery camera has a vertical slit aperture. The camera is fixed opposite the bullet. The film in the camera and the bullet have synchronised rotation (in opposite directions). They rotate with the same angular speed through 360^0 in the same interval of time. The images coming in front of the slit are record on a strip, merged into each other giving it a connected photograph of the circular surface, which is recorded on the film. The image is transferable to a computer and then the image can be

1. sent to various destinations through e-mail/Internet.
2. be printed on a strip/film/ sheet and can be compared with similar sheets prepared from test bullets. The comparison indicates the common or different source(s) of the marks.
3. Compared with similar images to ascertain common source or otherwise.

The camera has certain advantages:

1. It provides a comprehensive view of all the marks on the cylindrical surface of the projectiles in one go.
2. The images can be examined and compared at different (even distant) places simultaneously without the actual crime exhibit. A number of images (photographs) are prepared and circulated among different experts. Online transmission of the images, through the Internet, has dispensed with the necessity of preparing and sending image strips or photographs.
3. The instrument, previously (in the initial stages), did not give satisfactory results with deformed bullets. However, the problem has been overcome since.
4. It has reduced the drudgery of microscopic examination for long hours.
5. The identification/non-identification of the common source through the processes is both cost and time effective, once the initial investment has been made.

The importance of the periphery camera has gone up very high with the advent of Firearm Data Banks, the repository of digitized identification data of firearm marks (thumbprints of firearms). NIBIN[8] (National Integrated Ballistics Information Network) is such a system in which automated comparisons of identification data is done.

8. For more details see the author's book: ***Firearms in criminal Investigation and Trials***, LexisNexis, 2017.

8.8.10 Photographic Comparison

The comparison microscope and other comparison devices are useful and convenient, but they are not indispensable, in some cases. An ordinary microscope comparison can be made via a photomicrographic camera. The corresponding photograph of the test and crime exhibits are prepared and compared.

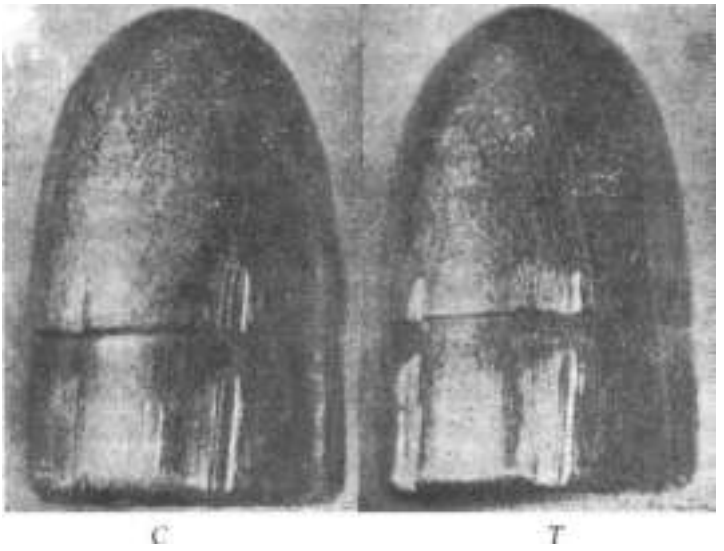

Fig. 8.19

Even macrophotography can identify bullets (C and T) under favourable circumstances as in the above case

8.9 ODD IDENTIFICATIONS

8.9.1 Damaged Cartridge Cases

In illegally improvised (also known as country-made) firearms, fired cartridge cases are often damaged extensively. The percussion cap is found pierced or blown off. The shells are found shattered. However, identification of the used firearm is still possible even in such cases most of the times; because they carry numerous marks from the firearms. Breech face/extractor/chamber marks are frequently found on the damaged cartridges.

8.9.2 Damaged Bullets

Crime bullets, fired from high velocity rifles, are rarely recovered in their original shape. They are deformed and sometimes fragmented. Some portions of the bullet, especially of the jackets of the bullet, however, retain un-mutilated marks. They carry sufficient details to permit their linkage with the firearm. Lead bullets in some cases, may not retain the barrel marks.

8.9.3 Burnt Bullets and Cartridge Cases

The culprit may have thrown a cartridge case in a fire after the occurrence. If it has not melted, the marks found on the remnants, may allow identifications. Lead bullets ordinarily lose all identifiable marks, while jacketed bullets and metal bases of cartridges retain the marks.

In a murder case, the body of the deceased was burnt. The investigating officer, however, recovered a lead mass from the ashes. Its evaluation revealed that it originally formed a bullet. It contradicted the defence version that the deceased died a natural death. The bullet mass, however, could not be linked to the suspected firearm. (CH)

In another case of murder, followed by arson; a burnt cartridge base was examined. It was possible to identify the firearm that had fired the cartridge. (CH)

8.9.4 Smooth Barrel Marks

Bullets, balls and slugs are also fired through smoothbore firearms. The firing process imprints the barrel irregularities (its thumbprint) on the fired projectiles in the form of scratches (striations/lines). They are individualistic and allow identification of the barrel from which they have been fired. Test exhibits are prepared by firing similar bullets, balls and slugs through the firearm barrel. Alternatively, bullets or slugs of the diameter of the bore are prepared and pushed through the barrel of the firearm. They pick up the barrel marks.

The comparison of the crime and test exhibits identifies the possible common source; or, eliminates the suspected source.

8.9.5 Buckshot[9] and Pellets

Formerly, the identification of buckshot and pellets fired through a smoothbore firearm was considered impossible. Experiments in the author's laboratory have proved it otherwise.

It appears that buckshot packed between the wads in a cartridge, is pushed through the barrel without any appreciable sideway (or turning) motion. The buckshot on the periphery is scratched by a segment of the inner surface of the barrel. They pick up the marks from these segments (corresponding to a land of a rifled barrel) like bullets. The marks of a given segment of a barrel are consistent like those of a land marks in a rifled firearm.

Test marks are obtained on a specially prepared slug that fits tightly in the barrel. It is pushed through the barrel (without turning motion). It takes up marks completely from the internal surface of the barrel.

The comparison of the marks on buckshot with the marks on the slug is carried out with a comparison microscope like a bullet.

Buckshot and pellets are sometimes housed in a sleeve (power piston wadding!), placed in a cartridge. The sleeve prevents/protects the pellets or buckshot from being scratched by the barrel. Such buckshot cannot be linked to the firearm through which they are fired.

9. In a landmark judgment (*State of Madhya Pradesh v Paltan Mallah*, **AIR 2005 SC 733 : 2005 Cr LJ 918)**, the Supreme Court of India has accepted the buckshot identification.

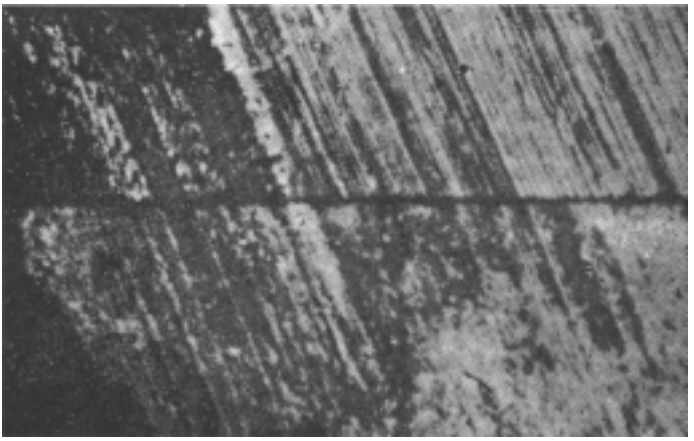

Fig. 8.20

Striations on buckshots and test slugs can be matched liked striations on bullets

8.9.6 No Firearm[10]

Sometimes the firearm used in a crime is not recovered in the early stages of the investigation or at any stage. The investigating officer usually seeks guidance about the nature and number of the firearms involved. The IO provides the fired ammunition recovered from the crime scene. It is possible to give the number and the types of firearms used from the fired ammunition provided, in some cases. The number of firearms used can be given in almost all cases, from their individualistic marks present on the fired cartridges/projectiles.

The class and individual characteristics in the marks on the fired ammunition give an idea about the number, nature, calibre and possible make of the firearms used[11].

> *In a famous multi-murder case, fired projectiles (bullets fragments, bullets, buck shots and some wad pieces) were recovered from the bodies of the victims. By careful examination it was possible to indicate that four firearms: two revolvers of .32 and .38 calibres, one .30-06 rifle and one 12 bore shotgun had been used. (CH)*

8.10 GUNSHOT RESIDUES[12]

The gunshot residues (GSR), also known as firearm discharge residues, are a product of the burning of propellants in cartridges when they are fired from firearms. The term GSR (a sort of acronym) has become popular for the gunshot residues and shall be used frequently in the discussion in the book.

10. Popularly known as **"No gun work"**.
11. It is unfortunate that the fact was not brought convincingly to the notice of the Supreme Court in the case Sidharth Vashisht *@ Manu Sharma v State of Delhi (NCT)*, **(2010) 6 SCC 1**. The Apex Court was not made aware of the fact convincingly.
12. More details on GSR are in chapter 13 of the author's Book: ***Firearms in Criminal Investigations & Trials***, 2017, LexisNexis.

8.10.1 Nature

Gunshot residues are complex mixtures of materials produced in gunshot firing. Their composition depends upon:—

1. The nature of the formulations of the propellants and primer mixtures.
2. The composition of the projectile materials.
3. The barrel scrapings.

8.10.1.1 Black Powder Residues

Forty to 60% of the combustion products of black powders are gases and the rest are solids. The gaseous products are carbon monoxide, carbon dioxide, hydrogen sulphide, nitrogen, oxygen and water vapours. The solid residue consists of carbon, sulphates, carbonates, thiosulphates, sulphides and sulphites of potassium, unconsumed charcoal and sulphur.

The black powder is not used in modern ammunition. The evaluation of its residues is needed only in those cases which involve muzzleloaders or home-made black powder filled cartridges.

The primer mixtures contain mercury fulminate, antimony sulphide, antimony oxide and potassium chlorate. In some primer mixtures, potassium chlorate is replaced by barium peroxide, barium nitrate and lead peroxide. Likewise, mercury fulminate in some primers is replaced by a mixture of sulphocyanide of copper or lead, TNT, tetryl and sulphur. The primers contribute oxides of barium, antimony, copper, lead, potassium chloride and mercury to the gunshot residues.

8.10.1.2 Smokeless Powder Residues

The detectable inorganic materials in the GSR of modern smokeless propellants are:

1. Lead, from the bullets and the primers
2. Barium, from the primers
3. Antimony, from the primers
4. Copper, from the jacket
5. Iron from the barrels
6. Carbon monoxide, absorbed in the skin and the flesh, from the propellants
7. Nitrates, from the inorganic oxides and from the propellants
8. Nitrites, from the propellants
9. Zinc, from the jacket
10. Nickel, from the Nickel coating of the shells in some cases
11. Carbon particles

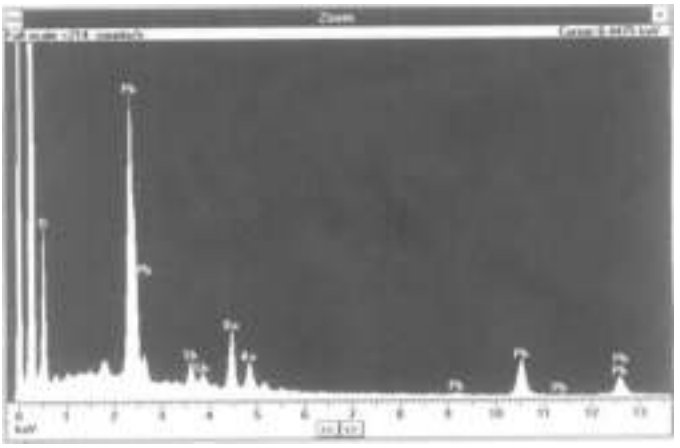

Fig. 8.21

Lead, antimony and barium from the GSR through EDX, with SEM. The presence of the elements is a sure indication of the GSR

The detectable organic components of the GSR, of smokeless propellants, are:

1. Nitro-cellulose, the unburnt or the semi-burnt part of the main component of the propellant
2. Nitroglycerin, the unburnt or semi-burnt part of the double base propellants, if used
3. DPA (Diphenylamine), used as a stabilizer, in all single base propellants. It constitutes roughly 1% of the propellant weight
4. Ethyl centralite, used as stabilizer, in double base powders (~1% by weight)
5. Phthalates, used as the plasticisers
6. Glyceryl triacetate, used as plasticisers
7. Nitroguanidine, used as plasticiser
8. DNT (Di-nitro toluene), used as flash suppressant
9. Bullet lubricants
10. Residual GSR constituents, from the barrel from previous firing

The smokeless propellants produce mostly gases. The gases are carbon monoxide, carbon dioxide, nitrogen, oxygen and water vapours. Oxides of nitrogen are produced if combustion is incomplete.

The solid residues, in addition to those mentioned above, are elemental carbon in a fine state called molecular carbon, potassium carbonate, chloride and antimonate. They are from stabilisers.

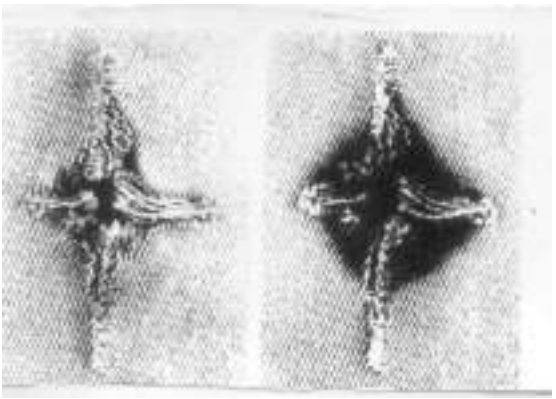

Fig. 8.22
Tear and smoke deposit on jacket

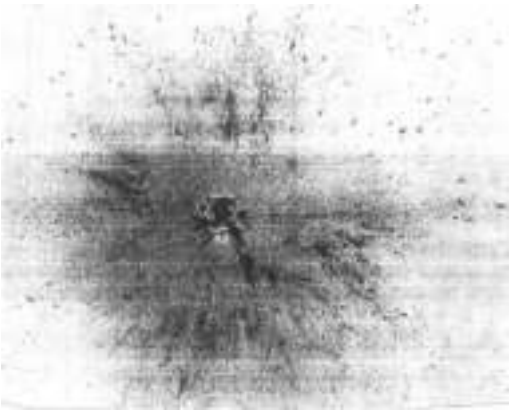

Fig. 8.23
Back-spattered GSR on the back surface of an intermediate target placed close to the main target

8.10.2 Importance

The examination and the evaluation of the GSR helps to solve a number of problems:—

1. Has the given gun been fired?
2. Has the given projectile/cartridge case been fired?
3. Did the suspect fire a firearm? In fake suicide cases, the question may be crucial.
4. Is the given wound a firearm injury?
5. Is the given wound/hole (on clothes, bones, furniture) a gunshot hole?
6. What was the firing range?
7. When was the given gun/projectile/cartridge case fired?
8. Is the given wound/hole an entrance/ exit hole?
9. Is the given incident of shooting a case of suicide/homicide/accident?

8.10.3 Location

The GSR is found on:

1. The hand(s), clothes, hair and face, of the shooter
2. The person standing near the shooter/victim
3. The objects at the shooting site; bedding, furniture
4. the air of closed rooms, if the shooting took place in a room
5. The area around the projectile entrance wounds/ holes, at the target (including clothes, exposed or affected skin,)
6. Around the exit wounds, in rare cases
7. In the internal track wounds in close range firing
8. The firearms – its inner and outer surfaces,
9. The fired cartridge cases
10. The fired projectile(s)
11. The articles around the target site
12. The intermediate targets.

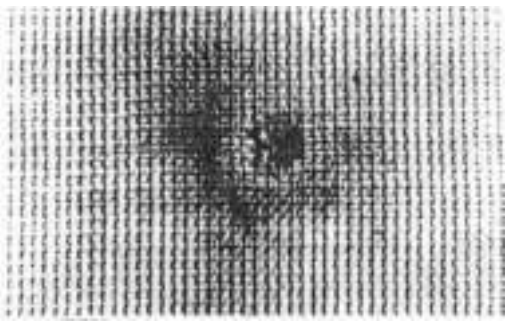

Fig. 8.24

IR photography reveals
GSR on dark cloth, indicating close range fire

8.10.4 Collection

There are a number of methods to collect GSR including the ones given below:—

8.10.4.1 Dry Methods

8.10.4.1.1 Wax

Wax of suitable melting point is melted in a vessel and gently applied to the hand(s) of the suspect with a brush until it acquires sufficient thickness (1 to 2 mm). It is allowed to set. It is then peeled off.

The peeled off wax cast picks up the GSR particles from the hand(s).

8.10.4.1.2 Cellulose Acetate solution

Cellulose acetate solution, in acetone, is applied to the site bearing the GSR. It is peeled off after the evaporation of acetone. The cast picks up the GSR.

8.10.4.1.3 Collodion solution

The collodion solution is sprayed on the site where the GSR particles are present. The film is rein enforced with nylon fibres. The film picks up the GSR It is peeled off, when the solvent has evaporated.

The re-enforcement prevents damage to the cast on normal handling.

8.10.4.1.4 Adhesive tape

Adhesive tape (or adhesive aluminium foil) is pressed, repeatedly, on the surface bearing GSR. It picks up its particles. The tape is kept in a vial with adhesive surface inside the vial, before and after the use. The tape is mounted on specimen stub for examination.

8.10.4.1.5 Acetic acid impregnated sheet

A cellophane sheet impregnated with acetic acid is pressed against the site. It picks up lead particles.

8.10.4.2 Wet Methods

1. A filter paper, moistened with dilute acetic acid, is pressed against the spot suspected to bear GSR particles. The paper picks up the particles.
2. The site bearing the gunshot residues is swabbed with a piece of cotton cloth, moistened with dilute hydrochloric acid (10%) or with nitric acid (5%). It picks up GSR particles. The swabs, from various parts of the hand, are collected separately.
3. The hands are rinsed thoroughly in dilute nitric acid (50 ml of a molar nitric acid is used) placed in a plastic bag. The solution obtained is freeze dried and the residue tested for GSR.
4. The residues in the barrel are collected by washing the barrel with hot distilled water. The washings are tested for GSR.

8.10.4.3 Collection of Organic Residues

The evaluation of the organic components of GSR has acquired tremendous importance. The following are the important collection techniques:—

1. *Swabbing*.—A small cotton wool ball, a clean cloth piece, or a filter paper is moistened with an organic solvent (acetone, ether or alcohol) and the site is swabbed. The swabs are collected and GSR is extracted and tested.
2. *Tape lifting*.—An inert tape of suitable width (2-3 cm) is taken and the site is taped. The tape is used as such, or extracted and the extract is utilised for further testing.
3. *Vacuum lifting*.—The techniques are especially useful to collect GSR from clothes. The material deposited on the filter disc is extracted with a suitable solvent for further processing.

8.10.5 Evaluations: Detection/identification

A lot of research activity to exploit the evidential potential of GSR is going on. Excellent techniques have come up to detect/identify/quantify GSR.

The following processes are used:

8.10.5.1 Visual Examination

If a firearm is discharged from a close range, visual examination reveals burning, blackening, tattooing and other manifestation of GSR. Their presence indicates a gunshot fire. A hand magnifier or a low power stereo microscope and a strong light source improve the detection of GSR. However, often the quantity of GSR deposits is meagre and visual examination does not reveal the GSR. The expert therefore uses other physical and chemical methods, including the following:

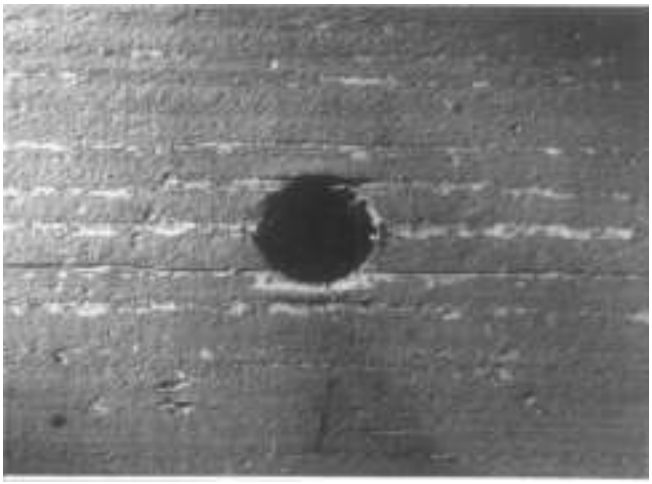

Fig. 8.25

No GSR around the clean hole in a wooden door: contact shot!

8.10.5.2 Infra-red Photography

Infrared photography proves useful if the GSR is on coloured clothes and the colour is masking their presence. The images of GSR come up in the IR photograph.

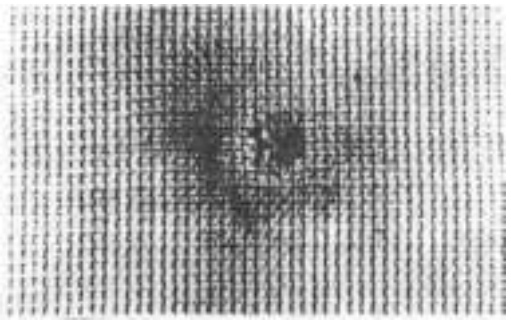

Fig. 8.26

IR photography reveals GSR on dark cloth, indicating close range fire

8.10.5.3 Soft X-rays Radiography

The lead metal is opaque to X-rays. Radiography reveals lead particles in the deposited GSR. A soft X-ray radiograph of the suspected area or hole reveals the radio opaque deposits in a characteristic pattern, indicative of a gunshot fired.

8.10.5.4 Chemical methods

There are many Traditional Chemical methods. Some of them are still in use because of their simplicity and ease. They include:

- Dermal Nitrate Test
- Walker's Test
- Spot test for lead.
- Harrison and Gilroy's Test.
- Price Spot Test.

8.10.5.5 Dermal Nitrate Test

Dermal nitrate test was frequently used prior to 1950, to identify the shooter. The test is simple. It identifies nitrates in the GSR. Nitrates are picked up on a paraffin wax cast as described earlier. The residues on the cast are treated with diphenylamine dissolved in strong sulphuric acid. The formation of blue colour spots indicates nitrates. They are, in turn, indicative of the presence of the gunshot residues.

The test is not specific to GSR. Many common materials give positive reaction with the above reagents. The test is no longer used.

8.10.5.6 Walker's Test

Walker's test is widely used even today. Its simplicity and greater specificity makes it a convenient test.

A desensitised glossy bromide paper is taken. It is treated with 2 naphthyl-amine 4:8-disulphonic acid (5%). The bromide paper is placed over a table with the treated surface on top. The cloth bearing the gunshot residues is placed over the bromide paper. It is covered with a towel moistened with 20% acetic acid and the arrangement is pressed with a hot electric iron for about five to ten minutes. Dark red spots appear on the bromide paper. They indicate GSR.

A modified version of the test is as under:

A piece of filter paper is moistened with acetic acid. It is pressed against the target surface. It picks up the gunshot residues. The filter paper is then sprayed with a solution of 2 naphthylamine sulfanilic acid and citric acid. The pink coloured specks indicate nitrite particles. They, in turn, indicate GSR.

The test is useful to:

1. Identify the bullet entrance holes and wounds.
2. Help to determine the range of fire.
3. Ascertain whether a firearm, bullet, or a cartridge, has been fired or not.
4. Estimate the approximate time of fire. The diminishing intensity of the colour formed is the indicator of the time elapsed.
5. Identify a shooter.

8.10.5.7 Harrison and Gilroy's Test

Harrison and Gilroy's test determines the presence of lead, antimony and barium through spot test.

The gunshot residues containing the metallic constituents are collected on a piece of cotton cloth (moistened with dilute hydrochloric acid) as described earlier. The cloth is, then, tested as under:

1. A dried piece of test cloth is treated with one drop of triphenyl methylarsonium iodide alcoholic solution (10%). The appearance of an orange ring, in about two minutes' time, indicates the presence of antimony.
2. The test cloth bearing the orange ring is dried and two drops of sodium rhodizonate solution (5%) are put in the centre of the ring. Red colour development, inside the ring, indicates lead, barium or both.
3. The test cloth is dried again. A drop of dilute hydrochloric acid (1 : 20) is placed on the red spot developed in (2) above. If the colour changes to blue, lead is indicated. If the colour does not change, barium is indicated.

The test is useful to identify a shooter or a bullet hole. The test is, however, not popular. It gives unstable colours. The three elements interfere with one another. The results are not quantitative.

8.10.5.8 Price's Spot Test

This technique involves the identification of lead through a standard spot test using, sodium rhodizonate solutions. The gunshot residues are collected from the hands on a piece of cloth moistened with 1% hydrochloric acid. The test does not offer any advantage over Harrison Gilroy's test.

8.10.5.9 Neutron Activation Analysis

The examination of gunshot residues by Neutron Activation Analysis depends upon the presence of antimony and barium. When the gunshot residues are exposed to neutron bombardment in a nuclear reactor, antimony and barium capture one neutron each to give radioactive antimony and radioactive barium

$$(Sb_{121}, Sb_{122})$$
$$(Ba_{138}, Ba_{139}).$$

The radioactive nuclides emit gamma rays. Evaluation of the energy and half-life help identify and estimate the isotopes. The estimation is usually done by comparing with the standards. Neutron activation analysis is a highly sensitive technique. However, it is cumbersome:

1. It needs a reactor for the neutron source, which is scarce.
2. It is time-consuming.
3. It needs a lot of pre and post-activation chemical treatment of the samples. For example, sodium and chloride ions from perspiration have to be eliminated for proper estimation.
4. The technique is not suitable for analysis of lead, which is the most important metallic constituent of gunshot residues.

8.10.5.10 **Flame-less Atomic Absorption Spectrometry**

An atomic absorption spectrometry is an extremely sensitive and convenient technique for the evaluation of the gunshot residues. It can detect the elements in nanogram and picogram ranges.

Atomic absorption spectrometry works on a very simple principle. An element absorbs the radiation of the same wavelength as it emits when excited. The suspected element (in gunshot residues) is taken into an atomiser (a graphite tube or a Tantalum strip) and is excited by heating. The radiation from a discharge tube with the suspected metal electrodes is passed through the atomiser. The loss of intensity in radiation gives the measure of the quantity of the metal in question.

The technique is useful and popular for the examination of the gunshot residues. It is less costly, consumes less time and is applicable for lead estimations also.

8.10.5.11 Scanning Electron Microscopy (SEM)

Fig. 8.27

A typical Scanning Electron Microscope
(with EDS detector, electronics console, and visual display monitors)

Scanning electron microscopy is the most impressive and effective method to evaluate the gunshot residues:

1. It photographs the powder residue particles at site. The specific shapes of the lead particles indicate GSR.
2. It provides elemental analysis of the elements in the powder residues.
3. The analysis is non-destructive in nature.
4. It gives the number of particles per unit area.

In scanning electron microscopy, a fine beam of electrons is focused on the material under study. The electron beam has the following effects:

1. **It generates X-rays;** the generated X-rays are used to find out the elemental composition of the material with an X-ray analyser. The X-rays are characteristic of the element.
2. **It gives cathode luminescence;** when the electron beam falls on certain materials, it creates luminescence, specific of the element(s) involved. The spectral analysis of the light indicates the elements involved.
3. **It creates backscatter,** some electrons are reflected back (backscatter). The photographs obtained from these electrons have 3-dimensional effect, which permits the topographic evaluations of the surface of the GSR particles in a much better way.

4. **It provides high magnifications/resolution;** SEM can give magnifications of the order of a hundred thousand (10^5) times with high resolution and thus, provides an excellent tool for the structural studies of the GSR particles on the surface.

The scanning electron microscopes have been introduced in most of the modern Forensic Science Laboratories. They should help to evaluate the gunshot residues more efficiently. The paraffin lifts, adhesive tapes, cellulose acetate or the collodion lifts are used to evaluate the gunshot residue under a scanning electron microscope. Characteristic spheroid shapes indicate the presence of lead globules. Identifications of antimony and barium, through EDX, make the identification certain.

The use of Scanning Electron Microscope in Forensic Ballistics has a profound impact on the entire field of Forensic Ballistics. It is because:

1. It gives a high resolution. It is about 300 times more than that in the optical instruments.
2. It has extremely high depth of focus. Thus, the images give 3-dimensional effect.
3. It has almost unlimited magnifications.

It is an instrument of choice for the examination of all sorts of microscopic surface characteristics involved in Forensic Ballistics. EDX, an accessory, has increased the utility of the instrument many times.

The working principle of the technique is simple. A beam of electrons is impinged on the surface. The extent, direction and intensity of secondary electrons emitted by the surface depend upon the surface structure/composition of the surface in question and the original beam. The secondary electrons scattered by the surface are utilised to build up the image of the surface.

The excellent discrimination qualities/sensitivity/specificity of the microscope is making it indispensable in the examination of:

1. marks on fired ammunition
2. GSR
3. Bullet marks/hoes

The scanning electron microscope requires a high vacuum (2×10^{-5} mm Hg). In the ordinary atmosphere, air absorbs the electrons. The exhibits, therefore, are placed in vacuum. They must also be non-volatile and good conductors.

The area of the sample, which can be scanned, is about 8 cm square. The positioning of the exhibited is done by remote control.

The magnification range varies from 5 X to 100,000 X. In forensic ballistics, the magnifications beyond 1000 X are rarely needed. The resolution of the order of 200 A is achieved at 50,000 X.

The scanning electron microscope has been programmed to search for the powder residue particles on the clothes of the victim or on the various lifts. Identification and analysis are carried out simultaneously and automatically. The work of the analysts has thus, been reduced considerably. Unfortunately, the cost of the equipment is high. It is not being used extensively in India. In prosperous countries the scanning electron microscope has become indispensable to the ballistics laboratories.

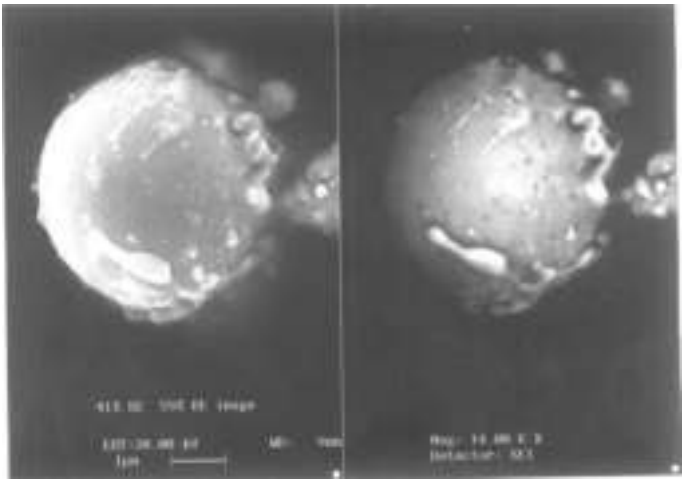

Fig. 8.28

GSR Particles Through SEM

8.10.5.12 X-Ray Fluorescence

Another method of choice for the analysis of GSR is the use of X-ray fluorescence. The technique has been extensively used to carry out both qualitative and quantitative elemental analysis of the residues. The comparatively low price of the needed equipment, the simplicity of the technique and of the operation, and the highly efficient results make it one of the most convenient methods for the evaluation of powder residues.

Autoradiography, photoluminescence, lead isotopy, emission spectroscopy and polarography have also been employed.

8.11 RANGE OF FIRE

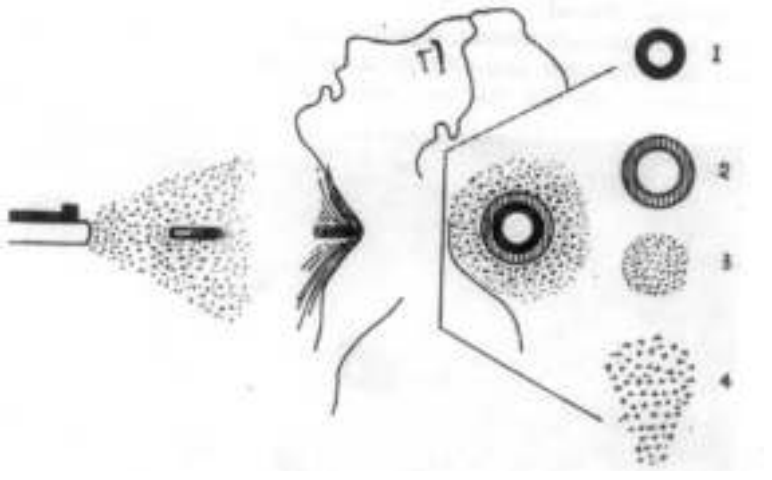

Fig. 8.29

The mechanism of formation of firearm injuries and of formation of extraneous deposits

Determination of the range of fire is an important aspect of forensic ballistics. If proper photographs, sketches, description of the injuries, the suspected firearm and the required ammunition are available, an accurate estimate of the range can be made. The following features are important indicators:

8.11.1 Muzzle Patterns

When a firearm is pressed against the human target and fired, the muzzle of the firearm leaves an imprint on the target. The existence of the muzzle pattern, therefore, indicates a contact wound. Such wounds are often observed in suicide cases. The whole charge (projectiles, wads, if any, smoke, unburnt or semi-burnt powder particles and hot gases) enter into the target. No burning, blackening, and tattooing phenomena are observed around the entrance hole. Instead, on careful examination, they are observed inside the wound.

If there is no space for the expansion on the gases inside, they come out through the entrance hole and in the process, they evert the edges and often tear the skin around the entry wound hole to give star-shaped tears. The novice often mistakes it for an exit wound.

8.11.2 Scorching

The flame and/or hot gases scorch/burn/singe/char the target sometimes. It is a close-range phenomenon. The range is a few centimetres in the case of pistols and revolvers to a few decimetres in the case of rifles and muskets. The flame and hot gases do not travel afar. The burning range depends upon the length of the barrel of the firearm and the age and the nature of the propellant charge.

Some persons believe that scorching, is caused by hot projectiles. It is not so as the projectiles do not get heated to temperatures at which scorching occurs.

Scorching/singeing/burning/charring is often confused with blackening, dirt-ring and the contusion caused by the impact of the projectile. Burning can be distinguished easily from blackening and dirt-ring. Swabbing the surface with spirit, removes the dirt and blackening while charring remains. Contusion-ring is distinguished from the burning effect through its shape and microscopy of the skin and flesh. The contusion is in the form of a regular round or oval ring, burning is irregular, comparatively. It is especially so if the weapon has flash holes.

8.11.3 Blackening

Blackening around the wound is caused by the deposition of smoke particles by all types of powders at close ranges. The intensity is maximum in the case of gunpowder, less in semi-smokeless powder and least in smokeless powder with the same quantity and from the same range. The colour also varies slightly. It is black in gunpowder and greyish black in smokeless powder.

Smoke particles are formed due to the burning of the powder charge. They are propelled along with the projectile charge. Being light particles, they soon lose their velocity and deposit on any object which comes in their way. The blackening range is roughly three times the burning range.

8.11.4 Tattooing/peppering/stippling

In tattooing (also called peppering, stippling) unburnt or semi-burnt powder particles embed into the surface of the target. These particles are slightly heavier than the smoke particles. They, therefore, retain motion to somewhat longer distance. Tattooing range is, therefore, is longer, about one andahalf times the blackening range.

The age and quality of the propellant affect the range and density of tattooing.

8.11.5 Powder Residues

The amount of GSR left at the target is predominantly dependent upon the range, though arm and ammunition are also important factors. The expert performs experiments with the same arm and similar ammunition from various ranges, close to the estimated range of the crime deposit(s). He gets fairly accurate range by comparing the crime and test deposits.

The maximum powder range in handguns is about one meter. It assumes great importance in determining the real or fake nature of an alleged suicide.

8.11.6 Metal Particles

Metal particles produced by lead fouling and scraping of the projectiles form part of the ejected GSR. They, being heavier, travel to a longer distance than the powder or smoke particles range. The range up to which these particles travel varies with the firearm and the ammunition, particularly on the size of the metallic particles of the fouling.

The particles are, ordinarily, not visible to the naked eye. They are detected by soft X-rays or by chemical tests.

8.11.7 Wad Distribution

A number of wads are found in the older version of the shotgun ammunition. They are projected along with the other ejecta. They enter the target up to about three metres. If they are not obstructed, they scatter from five metres to about ten metres or more. The distance between the victim and the wads is used to estimate the range of fire. Test firing with the suspected firearm and similar ammunition provides better approximation of the range.

The weather conditions have an important effect upon the scattering of wads. They may be blown far away or retained near, depending upon the direction and velocity of the wind at or immediately after the time of firing. The weather is, therefore, taken into account for the determination of the range of fire from wad scattering at the scene. The cushion wad being heavier goes to much longer ranges than the other wads. In power piston wads there is one moulded wad which separates the charges, seals the barrel and protects the projectile charge. It is made of plastics and is heavier. It goes to considerable distances. Its position at the scene can provide guidance to estimate the range.

8.11.8 Pellet Patterns

The area covered by pellets fired from a shotgun is proportional to the distance between the muzzle of the firearm and the target. Greater the range, greater is the area covered. The spread is affected by the length of the barrel of the firearm, the choke characteristics of the muzzle of the firearm (whether choked or not, the degree of choke) and the condition of the ammunition. Test experiments with the suspected firearm and corresponding ammunition (make, batch, pellet size), give pellet patterns which provide a fair estimate of the range. The following general information may be useful to all concerned:

1. Generally, in a standard shotgun, the whole charge enters the body *en masse* up to a range of about two metres, forming a rat-hole varying in diameter from about two centimetres to about six centimetres, depending, mainly, upon:
    1. The distance between the muzzle and the target,
    2. The constriction (choke) of the muzzle, and
    3. The size of the pellet charge.

2. There is a rat-hole surrounded by individual holes from two metres to about seven metres.
3. The individual shot may form its separate hole from a range of three to four metres in buckshot charge.
4. The separation of the holes is usually complete from about ten metres onward, especially in buckshot charge.
5. The spread of pellets at various ranges with different degrees of chokes is given below for rough estimation:

Table 8.2

Pellet spread varies with range and chokes

Range in Metres	**Pellets spread; circle diameter in cm**			
	True Cylinder	Improved Cylinder	Half Choke	Full Choke
10	54	38	31	23
15	71	55	44	33
20	88	72	58	45
25	105	89	73	59
30	122	106	90	75
35	140	124	108	94

The above table is not applicable to improvised pistols and guns made by local blacksmiths which do not conform to any specifications. The barrels are either too loose or too tight. The lengths of barrels are often short. The inner surface is rough. Consequently, the pellet patterns are not only different from standard firearms, but they vary from one shot to another in the same firearm. These firearms do not lend themselves to reliable range determinations.

For standard firearms, with half choke, a rough idea of the range is obtained from the formula:

D = 3 R; here:

R = range in metres, and

D = diameter of dispersion in centimetres.

8.11.9 Direction of Wound

If the direction of the wound is not parallel to the ground level and the angularity is not due to deflection of the projectile inside the body, a fairly accurate estimate of the range of fire can be made. At least, the prosecution or the defence story of the occurrence can be verified.

In an appeal against the conviction against murder, the defence challenged the prosecution version of the occurrence. The deceased had been killed by pistol fire from across the ten feet (~ 3 m) wide street. The victim and the accused were standing on their respective roofs, which were at the same level. The wound of exit was five centimetres higher than the entrance wound level.

The defence produced a bust and a long probing rod. They tried to prove that the line of fire met the roof level at about two metres from the position where the victim was standing. They argued that the deceased, therefore, could not have been killed by the accused who was, at least, a metre away from where the line of fire met the roof level.

A careful study of the height of the deceased and accused, position of entrance and exit wounds and the thickness of the body revealed both mathematically and graphically that the killing was possible from across the street.

The High Court asked the author to verify the facts and the reconstruction of the defence. The defence in their demonstration had made errors by decreasing the body thickness and increasing the height of the exit wound, thus increasing the angularity.

The sentence was maintained. (CH)

8.12 FIREARM INJURIES

Medico-legal experts examine the victims with firearm injuries. The firearm expert has to evaluate them frequently. If each performs his function well and sticks to his field, no trouble arises. If they cross into each other's territory, there is often confusion. It is, therefore, desirable that they understand their roles and perform them well.

The correct evaluation/appreciation of firearm injuries is essential in reconstructing a shooting incidence. The burden of firearm expert testimony is increasingly shifting from the identification problems of firearms and fired ammunition to the reconstruction of the sequence of events to verify a given hypothesis. Is it suicide, accident, murder or killing in self-defence? Only correct evaluation/appreciation of firearm injuries can reveal the true picture of the occurrence.

8.12.1 Nature of Firearm Injuries

Ordinarily, a firearm injury has three parts:

1. The entrance wound,
2. The exit wound, and
3. The internal wound

In some cases, when the projectiles are retained inside the body there are no exit wounds. Sometimes the entrance or exit wounds are invisible. Here, the projectiles enter or go out through the natural orifices (openings) like mouth, anus, Cleavage of tissues may start or end at a hidden place.

Some years ago, the author attended the post-mortem examination of an assistant sub-inspector. Some unknown culprit(s) had shot him dead with a rifle. The projectile had entered the back of the neck. There was no visible exit wound. The medico-legal expert thought that the projectile must be inside the body. However, thorough X-ray screening did not reveal any projectile in the body. On the suggestion of the author, the wound was probed. The forward end of the probe came out of the mouth. The Medico-legal expert checked the mouth. He found lacerated mouth/broken jaws/teeth. The absence of the projectile could then be understood. It had escaped through the mouth. (CH)

Firearm entrance wounds may be circular, oval, key shaped, ragged or explosive. The last category (sometimes confused with wounds caused by explosives) is caused usually by high velocity projectiles or by shotgun fire from a close range when the whole ejecta enter the body at a point where there is no space for the expansion of the gases.

Ordinarily, the entrance wounds have smaller diameters than the diameters of the projectiles. Sometimes they may have equal or larger diameters even. However, the later formations are rare.

The exit wounds are frequently irregular, occasionally circular and at times gaping. The dimensions are, ordinarily, larger than those of the entrance wounds or the diameters of the projectiles causing the same.

The internal track may be a straight tunnel, or it may be zigzag due to deflection of projectile. Sometimes the track is multichannel due to fragmentation of the projectile or due to the formation of secondary projectiles.

The track may end inside the body. The projectile causing the injuries is found at the end of the track.

At times there is a small entrance wound approximately equal to the diameter of the projectile but inside a tunnel, many times larger than the diameter of the projectile is discovered. The exit wound is also much larger than the size of the projectile. Lacerated and damaged flesh, muscles, bone pieces, blood clots, protrude from the exit wound like lava at the crater of a volcano.

Firearms sometimes cause extraordinary injuries: incisions, abrasions, contusions, They do not have the usual three parts. They are sometimes confused with injuries from weapons other than firearms.

8.12.2 Wound Ballistics

When a projectile strikes the human body, it depresses and compresses the skin, flesh and bone tissues underneath the hit site. The continued pressure stretches them beyond the elastic limits if the projectile has sufficient energy. The projectile then pierces the stretched skin and enters into the body. The hole on the skin appears smaller than the size of the projectile which created the wound as the stretched skin bounce back to its original position.

The minimum velocity, known as threshold velocity, required to penetrate the skin is 40-50 m/s. The threshold velocity for bone penetration is about 60 m/s.

The projectile continues its onward progress until it leaves the body through an exit wound; or, if its kinetic energy is spent in overcoming the resistance offered by the clothes, skin, flesh and bones before it reaches the exit point. The projectile is found lodged inside the body in such situations.

Wounding effect of a projectile depends upon:

1. The target site,
2. The velocity,
3. The constructional features, and
4. The range

8.12.2.1 The target site

A human body is not a uniform medium. It is about 80% water. But it is not uniformly distributed. At places, there are bones, at other places, veins, nerves, muscles or blood vessels. Thus, the vulnerability is unevenly distributed. Skin covers them.

The total surface area of the outer skin of a human body is about 5000 cm^2. Careful considerations of the anatomy of the human body, reveal that about 43% of the total area (about 2150 cm^2) covers body parts (organs, cavities, nerves, blood vessels,) which are prone to easy damage. A projectile, hitting these parts, causes serious injuries.

Anatomical evaluations reveal that the average depth of protective tissues on the frontal side of the body is 0.6 cm, whereas it is 3.3 cm on the backside (> 5 times than that of the frontal

tissues). Thus, a frontal attack is likely to cause more serious wounds than the injury from the backside. The difference in wounding effect will be apparent dramatically only when the velocity of the projectile is around the threshold velocity.

Ordinarily, the velocities of the projectiles hitting the body are far above the threshold velocities in real crime situations. The protective tissues thus, do not play a significant role in shooting cases. They do help in the cases of attack with other weapons.

The body part hit by a projectile necessarily plays an important part. If a projectile cuts the skin only, it does not do much harm. Likewise, a projectile may hit a finger or a toe of a person without the latter being very much the worse for it. However, if a shot injures the brain, the heart, the spinal cord or aorta of a person, the person is disabled (stopped) almost at once. Often the injury is fatal. It is against this background that the elephant hunters try to reach the brain of the game, aiming at the area in between the ear and eye. The area is a circle of the diameter of about ten centimetres only.

Firearm injuries often cause shock. The main reasons/modes of shock are:

1. Loss of blood due to injuries
2. Hydrostatic pressure on a vital organ due to high velocity bullet impact in its vicinity[13]
3. Extreme fright
4. Weak heart

The shocking power of a projectile varies from person to person. This explains the extreme bravery shown by Pathans in Anglo-Afghan Wars. The British used Mark VI .303 ammunition/ projectiles. The bullet had effective velocities of less than 600 m/s. They did not cause explosive wounds. Consequently, the projectile did not cause sufficient shock (in physical sense). The Pathans though hit at non-vital parts, continued fighting.

8.12.2.2 The velocity

The velocity of a projectile has great influence on the nature and extent of body tissues damage. The energy of a projectile formula (**$E = l/2\ MV^2$**) explains it all.

The energy is proportional to the square of the velocity. If we double the velocity, the energy of the projectile becomes **Four** (4) times, if we treble the velocity the energy of the projectile becomes **nine (9)** times. This extreme influence of the velocity is, therefore, too evident to need further comment.

The wounding effect, on velocity considerations, has four velocity zones:

1. Velocities less than 400 m/s
2. Velocities from 400 to 600 m/s
3. Velocities from 600 to 1100 m/s
4. Velocities beyond 1100 m/s.

8.12.2.2.1 Velocities less than 400 m/s

In this velocity zone, no abnormal wounding phenomenon is observed. Usually the projectile does not fragment or deform to any appreciable extent unless it strikes a bone. The extent of deformation and deflection, if any, is depends upon the resistance the target imparts.

13. For details, see author's book: ***Firearm in Criminal Investigation & Trials***, LexisNexis, 2017, p 360.

8.12.2.2.2 Velocity zone 400-600 m/s

The projectile in this velocity zone behaves midway between similar projectiles of first and the third velocity zone. Lead bullets and expanding bullets start mushrooming. The extent of mushrooming depends upon the striking velocity, the constructional material and features of the projectile and the resistance offered by the target site. The tissue damage is greater, because the cross-sectional (also called projection area) increases as the projectile progresses forward. The projectile may or may not remain inside the body. If it goes out, the exit wound is larger than the entrance wound or the diameter of the projectile.

8.12.2.2.3 Velocity Zone 600-1100 m/s

Projectiles in this velocity zone show dramatic (and important) effects. They produce explosive wounds. For the formation of explosive wounds, the following explanations are given:

1. The high velocity projectile creates a vacuum behind it. As it enters the body, the air behind rushes in at a terrific speed and disrupts the body tissues.

   The explanation alone is not quite sufficient. The explosive wounds are caused even on targets kept and fired at in a vacuum.

2. The body parts hit by the projectile themselves become effective secondary missiles and cause extensive damage to the body.
3. The projectile fragments and these fragments cause extensive injuries.
4. The gyratory motion of the projectile is very high. A .303 Mark VII bullet, at the muzzle, spins at the rate of 300 revolutions per second (rps). The loss of revolutions is not more than 10% per second. The tissues, which come in contact with the projectile, are set into motion and churned. These tissues are torn off the adjoining tissues. The process inflicts injury on the tissues far beyond the immediate vicinity of the main track of the projectile.[14]

   Gyratory motion alone cannot be responsible for explosive wounds as experiments with small non-spinning spheres produced explosive wounds. However, it is well established that the wounding effect of a rotating bullet is far more extensive than that of the non-rotating bullet. This is because the projection area of the projectile increases with increasing distance. The deviation tendency (called 'yaw') is 800 times more in body tissues than in air. The projectile after a short passage in the tissue (say 5 cm) may be slanted by 50° to 90°. Thus, the projection area (area of the bullet touching the body tissues) will be increasingly more than the area when it is travelling in nose-onward position. The transfer of energy is, therefore, far more. As the damage is directly proportional to the energy transferred the rotating bullets cause much more damage than the non-rotating bullets.

5. Experiments with high velocity projectile fired in water, gel block, anaesthetised animals and cadavers have cleared the mechanism of the "explosive effect" of the injuries caused by high velocity projectile to a great extent.

The main effects of high velocity projectile, in its journey through the body are:

1. The projectile compresses the frontal air. It starts a shock wave. The intensity of the shock wave depends upon the velocity of the projectile and the energy transferred by the projectile to cause the shock wave. A projectile (0.5 cm diameter steel sphere) with a velocity of 1000 m/s causes a shock wave which compresses the target with

14. Due to hydrostatic pressure (New explanation).

a pressure of about 45 atmospheres (46 kg/cm^2) which alone is sufficient to kill a person. The shock waves are repetitive, but the intensity falls off almost immediately. The shock wave pressure falls off rapidly with time and distance.

2. A temporary cavity is formed which is many times larger than the size of the projectile causing the same. Its size depends upon the total energy transferred by the projectile. It has been calculated that the volume of the cavity is 7.85 cc/metre kg of the energy transferred by the projectile to the tissues. The volume is about 27 times the volume of the permanent cavity. This cavitation is responsible for breaking bones and tearing muscle far away from the path of the projectile.
3. The temporary cavity collapses after the passage of projectile, in a short time but due to inertia it pulsates and it is only after a few pulsations that the temporary cavity finally comes down to permanent cavity but in the meanwhile extensive damage has been caused to the tissues.
4. The major damage to the tissues is caused by the fast moving projectile which compresses and cuts the tissues in front and on the sides causing the permanent cavity and the extravasation of the tissues along the permanent cavity. The cut tissues are thrown away from the track, while, the compressed tissues are violently thrown against other tissues and are badly lacerated. These body tissues form the extravasated zone. The volumes of the permanent cavity and zone of extravasation are 0.32 cc. and 3.75 cc. for every metre-kilogram energy transferred.

Service and sporting rifles cause "Explosive" wounds usually when the striking velocity is more than 600 m/s.

8.12.2.2.4 Velocity Zone above 1100 m/s

In this (fourth) velocity zone the projectiles have velocity above 1100 m/s. Such ammunition is not commonly used in crimes. The author has not come across them in his long career in Forensics. Consequently, the details of the wounding effects of such projectiles are not available. However, it is mentioned that the effect of the projectile on the game is instantaneous death—as if the game has been struck by lightning.

> *In a reported case, a projectile travelling at 1100 metres per second hit a prairie dog in the right front paw. It killed the dog instantaneously(CH).*

A modern cartridge develops high velocities when the propellant charge burns in a confined space. The barrel provides the confined space once it is 'sealed' by the projectile or cushion wad.

The projectile is pushed out of the cartridge case as soon as the pressure inside the cartridge case is sufficient to open the mouth. This pressure ordinarily is insufficient to propel the projectile at a velocity sufficient to kill persons. If such an accident is reported, it is probably fake. Murder lurks behind the story.

8.12.2.3 The constructional features

The constructional features of a projectile have profound influence on the wounding effect. The main determinants of the features are:

1. Proper penetration and
2. Adequate transfer of bullet's energy for tissue damage

Proper shape and structural materials of a projectile are important factors for the penetration of the projectile, in addition to another factor.

The ideal projectile, to overcome air resistance, is streamlined bullet. It has pointed ends on both sides. They reduce friction promotes penetration. However, the manufacture of such bullets needs extreme care. The centre of gravity must coincide with the centre of the shape (form). If the two are separated even by .0025 centimetre the projectile will strike about 25 centimetres away from the target at 600 metres. Besides, they pass through the body without transferring adequate amount of energy to damage the tissues. The stream-lined bullets, therefore, are not used in actual practice.

The boat-tailed shape has been found for most of the projectiles. The bullets have flat base and pointed nose (spitzer nose). These projectiles have excellent penetration power.

The bullets usually have a lead core. It is covered with comparatively hard metal, like copper. The lead core gives proper sectional density to ensure proper ballistics. The envelope ensures proper penetration. Many variations of the bullet materials and shapes are current. For example, bullets have soft nose. It may be hollow, exposed, crosscut; or, made of softer metal (Aluminium).

The jackets which envelope the lead cores may have different thicknesses at different parts of the jacket. Such projectiles are called expanding bullets. They expand on striking and cause serious wounds having almost immediate shocking and stopping powers.

The expanding projectiles include soft nose bullets also. They are not intended to be used against human targets. However, not only criminals use them but even the military of all the countries, including India, have adopted expanding bullets for their military ammunition.

> *In the famous Kairon*[15] *murder case, one of the victims was hit with a soft point high velocity projectile. It hit the person on one side and created an exit hole on the other side. The whole mass inside appeared to have been torn out. The exit hole was several centimetres in diameter. Only the jacket found stuck in the spine was recovered which was linked to the suspect rifle of the culprit. (CH)*

The constructional features of bullets have undergone a sea change. The modern service and assault rifles of the world usually have:

- Smaller diameter (~5.5 mm)
- High velocity (> 900 m/s)
- Full jacket
- Soft point nose
- Steel core alone or along with lead core in some service rifle ammunition

They cause devastating wounds. For example, M16, USA service rifle bullets expand so much (they virtually explode) in the body that the tiny lead fragments give the appearance of a snow storm on a radiograph (X-ray photograph).

8.12.2.4 The range

The increasing range of fire in addition to reducing the velocity of the projectile, influences the wounding effects in the following ways:

1. The lighter ejecta is dispersed. It does not reach or enter the target.
2. The initial instability of the projectile vanishes.

The powder gases, smoke, semi-burnt or unburnt powder residue, metallic particles, dirt and wads, if any, constitute the lighter ejecta. They are important in the wounding effects

15. Partap Singh Kairon was a chief minister of Punjab for a number of years. He, along with 3 companions, was murdered on Ambala-Delhi National Highway.

only when the firearm is fired, pressed to the skin (contact wound) or from very close range (near contact wounds). Under these conditions, the ejecta enters the body *en masse*. The expansion of the gases takes place inside the body. The wound has the following characteristics:

- The damage inside gives the appearance of an explosion. The damage may not appear so extensive outside.
- Often there is no charring, blackening or tattooing on the outer margin of the injuries. The phenomena are seen inside the wound.
- The out coming gases evert the margins. The injury may look like an exit wound. Sometimes, the damaged or undamaged organs (like the intestines) may protrude from the wound.
- If the wound is at a place where the skin is close to the bone, some powder gases may enter in between the skin and the bone and tear the skin in a characteristic fashion to give a star-shaped ragged wound. The bone, in addition to crater formation suffers from multiple fractures.
- The shot charge will spread inside the body though there is only one entrance hole.
- Wads of a shotgun can inflict fatal injuries from close range.
- The blast gases (without projectiles) from the firing alone may cause fatal injuries in contact/near contact shots.

The instability of the projectile in the initial stages of its flight on the nature of the wounds has profound effect. The wobbling projectile may not strike the target in nose-onward position. Instead, it may strike in side-onward position, producing what is known as 'keyhole' wound. If the projectile ricochets or brushes against some light material, it may also produce keyhole at the target.

The extent of the instability of a projectile depends upon a number of factors dependent not only on the projectile, but also on the firearm and the cartridge.

8.12.3 Identification

The necessity of identification of firearm injuries may be evident from the following cases:

1. *In a murder trial, a number of injuries were found on the thigh of the 'victim' who had allegedly killed the deceased in self-defence. The injuries were circular holes; 3 mm. in diameter and about 2 cm. deep. The pellets had allegedly bounced out of the holes after striking the bone.*

   The author informed the court about the impossibility of the pellets bouncing out from 2 cm deep flesh and the that the injuries were fake. The defence story was disbelieved, and the "victim" was later convicted for murder. (CH)

2. *In a multi-murder case, the convicted persons filed an appeal on the plea that the eyewitness on whose evidence they were convicted, was not present at the scene.*

   The presence of the eyewitness had been proved by the prosecution through firearm injuries, which he had allegedly received at the scene. The doctor had extracted some pellets from the wound. The extracted matter proved to be sand and grit. The injury was probably fake (or, was the extracted material switched?). The High Court believed that the injuries were fake and acquitted the convicted persons. (CH)

3. *Some years ago, a culprit faked an injury on his person and produced himself before a doctor. The doctor after examining the injury extracted buckshot. He informed the police. The police registered a case under section 307 I.P.C. The culprit was allegedly an unknown person.*

After a few hours, the police found a dead body in the same village to which the first "victim" belonged. General inquiry by the police indicated that the deceased and the 'victim' were dead enemies.

The investigating officer suspected that the "victim" probably was finding a fool proof alibi. *It proved true. The buckshot extracted from the injured had never been fired from any firearm. (CH)*

4. *In a murder case the doctor recovered two pellets from the victim. The pellets had flat surfaces. There were six flat surfaces in three pairs on each pellet. In each pair the two surfaces were parallel. It could happen only if the pellets were hammered by changing the hammering position thrice in each case. The injuries were consequently fake. (CH)*

Firearm injuries are identified either from the extraneous deposits or from the characteristic damage produced by the shots.

Extraneous deposits include absorption of carbon monoxide, blackening, tattooing, dirt ring, wads, projectiles or their fragments.

Characteristic damage includes burning (also called charring or scorching), contusion, characteristic through and through wounds, and special wounds such as explosive wounds, ragged wounds, rat holes,

The medico-legal expert performing the post-mortem examination knows the above facts. They help in the correct evaluation of the firearm injuries. They are important in the reconstruction of crime also. All those who are concerned with the dissemination of justice should know/understand them.

Fig. 8.30

The case of hammered pellets. The fraud of the alleged 'victim' was revealed by the presence of 3 pairs of parallel surfaces

8.12.3.1 Pink Coloration

If a shot is fired from a very close range or in contact with the skin, some carbon monoxide (produced in the combustion of propellants) gets absorbed by the skin and flesh around the wound. It gives pink colouration, which indicates a firearm injury from contact/near contact range.

8.12.3.2 Blackening

Smoke deposit, in a close-range firing cause blackening. Smoke particles are light. They do not travel afar. Therefore, smoke deposit, *i.e.*, blackening is limited to a short range. The range determinants are:

1. **Black powder** gives denser blackening and to a longer range than semi-smokeless /smokeless propellants. The quality, quantity and age of the powder influence the intensity of the blackening .
2. **Firearms** in which combustion is not complete and proper give denser blackening.
3. **Ammunition** deteriorates with age. Old ammunition consequently gives more smoke and hence denser blackening.

All types of ammunition, including one containing smokeless powder, give smoke. The colour of the smoke deposit is grey though it may look blackish grey in black powder and light grey in smokeless powder. Blackening does not mean an intense black deposit of carbon particles.

In a murder trial, the defence counsel cashed upon the ignorance of a medical witness. The Medico-legal expert found blackening around the wound, which he believed to have been caused by black powder (and not by smokeless powder). He stated so, in cross-examination. The cartridge involved contained smokeless powder, while the counsel got confirmed from a ballistics expert.

The counsel argued that:

- *The injury on the victim was caused by a cartridge containing black powder.*
- *The suspect cartridge case recovered by the police, contained smokeless powder.*
- *The suspect, therefore, could not be the culprit.*

He got an acquittal for the accused in the trial court.

The State went in appeal. The High Court called in author to assist.

The author fired test cartridges of the same make and batch containing smokeless powder from the alleged distance with the crime firearm. They caused blackening even when the brown paper target was covered with the clothes worn by the deceased.

The *test targets sheets were produced in the court. The court set aside the acquittal and convicted the accused. (CH)*

8.12.3.3 Tattooing

Tattooing is also known as peppering or stippling. It is the deposit of unburnt or semi-burnt powder particles under the skin. The particles are slightly heavier than the smoke particles. They are propelled to slightly longer distances.

Tattooing, ordinarily, cannot be removed by swabbing.

8.12.3.4 Dirt Ring

The projectiles may carry grease on them. Grease attracts dust/dirt and gets collected on. It is deposited around the wound, when they enter the body, to give dirt ring.

In shotgun ammunition, shots are rubbed with graphite. A small amount of graphite remains adhered to the shots. It is deposited around the wound to give dirt ring, when they enter the body.

Dirt may be picked up by the projectile while passing through a medium (clothes or mud walls), or, in ricochet, from the surface from which the projectile has ricocheted. This dirt is deposited around the entrance hole.

Existence of a dirt ring indicates that it is an entry wound. It does not indicate/give range.

8.12.3.5 Foreign Materials

Projectiles or their fragments and sometimes wads are found inside the body. Their presence not only permit the identification of the firearm injury, but they also permit a fairly reliable guess of the firearm and the range.

*In Kairon murder case,(*supra*). However, it was possible to determine the nature of the firearms used in the murders from the projectiles and their fragments recovered from the victims. A .32 revolver, a .38 revolver, a .30 rifle and a 12-bore shotgun were used to kill the four persons. (CH)*

8.12.3.6 Charring

Charring (also called scorching, burning, singeing,) is caused by flame or hot gases produced in the combustion of powder. The same is found in shots fired from very close ranges. The site, the shape and the extent are characteristic. Charring produced by firearms can be distinguished from burning by other modes.

Charring is often confused with blackening, tattooing, dirt ring or even contusion rings and they are described as charring. In charring, the body tissues are affected by heat. The effects are different. Blackening can be removed with a cotton swab. Charring cannot be removed in this way. It is distinguished from other phenomena by careful physical and microscopic examination.

8.12.3.7 Contusion

The edges of a wound are contused by the impact of the projectile. The colour of the contusion is from reddish dark to bluish black. The colour varies somewhat with the age of the injury.

Contusions take the form of a belt (ring with some width) around the wound. It is of uniform width in circular wounds.

The contusions are differentiated by microscopic examination of the tissues. The tissues are ruptured and swollen (extravasations). There may or may not be any extraneous deposit.

8.12.3.8 Characteristic Wounds

Through and through wounds, ragged wounds, rat-holes, explosive wounds and key holes, by their characteristic nature, allow, in most of the cases, determination of the fact that they have been caused by firearms.

8.12.4 Post-mortem Reports

The medico-legal expert carrying out the medico-legal examination acquires the knowledge about the injuries *in situ*. He observes the characteristic deposit and damage for the identification of firearm injuries. Others, who are vitally interested in the study of the firearm injuries, the court, the counsels and the firearm expert, do not and cannot always observe the injuries on the victim. They depend upon the Medico-legal expert for the information. They need thorough description along with graphics/photographs/illustrations/sketches Unfortunately, they have often to go only by the scanty descriptions the expert gives.

The method of recording and collecting firearm injury evidence must undergo substantial improvements if the non-Medico-legal experts are to identify and evaluate firearm injury properly.

The courts including the counsels are well aware and accept the definite nature of the firearms- fired ammunition linkage. They seldom question its validity. Now, the burden on the firearm expert is to

1. Identify the firearm injuries
2. Indicate the nature and calibre of the firearm used to create the given injuries.
3. Verify a given hypothesis, whether the incident is a case of Murder? Suicide? Accident? Self-defence?
4. Ascertain the sequence of events.
5. Find the range and direction of fire,?

Consider the following cases:

1. *The injuries on a deceased were a rat-hole about 5 centimetres in diameter and a number of small orifices surrounding it. The alleged distance of fire, for the only shot fired was about 8 metres. Certain books on medical jurisprudence indicated that separate holes for separate buckshot are formed from 4 metres onwards. The defence counsel argued that small orifices might have been caused by the shot fired by the accused but the main injury – the rat hole – the killing shot – must have been created by some other person. The accused is, therefore, not the murderer according to the prosecution evidence itself.*

   Is this argument correct? (CH)

2. *The accused fired as per observed by the eyewitnesses, two shots. The medico-legal expert said that four shots were fired at the victim. If they were four shots, two shots must have been fired by some other person. This second person could have caused the fatal injuries.*

   Why prosecute the accused alone? (CH)

3. *A dead body was discovered in a jungle. A shotgun and a bandolier were lying close by. The person had one entrance wound in the right iliac region. The injury had gone steeply upward at an angle of about 45^0. The charge of a 12 bore cartridge was found lodged near the left armpit inside the skin. The relatives alleged murder.*

   Could it be suicide or accident? Or, was it murder, as alleged? (CH)

Fig. 8.31

Was the victim shot twice or four times? Extensive experiments showed injuries 1 to 4 were results of one shot

The above types of problems relating to firearm injuries crop up frequently in firearm-related deaths. The in-depth evaluations of firearm injuries are acquiring increasing importance. It is, therefore, essential that all the data collected is correct and complete. It is possible if:

1. The firearm expert visits the crime scene.
2. He attends post-mortem to observe the injuries, including internal track, suggest extraction of projectiles without further mutilation and to help proper appraisal of the close range phenomena and the effect on the injuries on the injured organs and the reconstruction of the occurrence.
3. Only qualified/experienced Medico-legal experts carry out medico-legal work.

4. The Medico-legal expert has some training/familiarity with forensic ballistics and firearms. Every Tom, Dick and Harry, as is the practice in most of the states today, should not do post-mortems. Only qualified medico-legal experts should handle medico-legal work
5. All the states appoint police surgeon, medico-legal experts to do the job as has been done in some states.
6. The medico-legal examiners appraise/record the injury evidence themselves, keeping in view the following:
   - Locate the projectile(s) through X-ray screening/radiography of the victims before post-mortem examination.
   - Collect/preserve the clothes of the victim and send them, in all cases, to firearm expert; properly packed and transported in such a way that the evidence on the clothes is not destroyed/detached/mutilated or contaminated.

     In a murder case, some injuries on the deceased were skin deep only. The defence counsel argued that it was so because the projectiles (buckshot) had spent their force as they were fired from a distant range.

     The facts contradicted the version. The eyewitnesses were certain that shooting was from a distance less than three metres. When the clothes were examined, not only exit holes gave away the lie, but the presence of nitrite particles around the entrance holes indicated a close range. The injuries were skin deep only because some shots had only grazed the skin and flew away. (CH)
   - Photograph, along with a scale, all the firearm injuries before/after cleaning. Send the washings to departmental Forensic Science Laboratory.
   - Discriminate contusion, dirt ring, blackening, tattooing and scorching by chemical and microscopic examination. Record the findings.
   - Videograph all the activities relating to post-mortem examination
   - Record properly the dimensions of each injury, angle of fire, inter-distances of various injuries *inter se*.
   - Identify/connect the exit wound with corresponding entrance wound.
   - Study, describe and record the entrance wound(s) carefully. They carry a lot of useful information.
   - Follow the projectile track(s) in the body from the entrance wound to exit wound in all fatal cases. Assess/record the internal damage carefully.
   - Inter-link the entrance/exit/internal wounds. Delineate them carefully on the skiagram/diagrams indicating correct position, angle, direction, deflections (if any), dimensions, broken bones and tracks of secondary projectile (if any). May use more than one chart, if necessary.
   - Recover the whole projectile charge including wads (if any) and any other foreign material. Indicate/describe the recovery site(s) on a diagram.
   - Write the report in layman's language.

     In a murder trial it was necessary to determine the site of entrance, exit wounds, to reconstruct the sequence of events. The medico-legal report was covered in such technical (or pseudo-technical) jargons that no head or tail could be made out. The local civil surgeon was requested for the rescue. But he also failed to locate the various injuries. The reporting Medico-legal expert was not available. Ultimately the effort to discern the contents of the report was given up. (CH)

The skiagram format used in post-mortem needs change. It should be printed on a millimetre graph paper, printed in very light blue or green ink. It will help to find out:

1. Height at which the injury
2. The exact location of the injury
3. The inter-distances between the injuries
4. The direction and size of the internal track
5. The dimensions of the injuries
6. The area covered by the various injuries—useful to indicate the projectile spread; important to determine the range in shotgun fire
7. Deflection of the projectile, if any

In addition, a textual description of the injuries is recorded in detail.

The importance of human skiagram/sketches for delineating injuries on graph papers cannot be over-emphasized. They help the non-medico-legal professionals to understand the medico-legal reports. The introduction of these graphic sketches is all gain.

The diagrams on graph paper have some indirect advantages also. The officers carrying out the medico-legal examination will be more careful in describing the nature and location of the injuries. Besides the troublesome names of the body parts will not pester the nonprofessional so much.

8.12.5 Evaluation

Evaluations of injuries help the investigation in many ways, including to:

1. Ascertain whether the given wounds are firearm injuries.
2. Indicate the type of firearm used to inflict the wounds.
3. Fix the number of firearm/shots fired to cause the given injuries.
4. Determine the fatal/non-fatal nature of the injuries.
5. Ascertain whether the injuries are ante-mortem or post-mortem.
6. Determine, the range of fire, time of fire, direction of fire.
7. Decide whether the wound(s) are suicidal/accidental/homicidal.
8. Find out if the victim could carry out the alleged activities after receiving the injuries in question or not.
9. Find out the age of the injuries in some cases.

8.12.5.1 Firearm Injury

The projectiles fired by the firearms have certain shapes, velocities and kinetic energies. They have specific characteristics:

- The shape of wounds,
- The pattern of destruction of the tissues,
- Presence of foreign bodies (GSR, bullets, their fragments, pellets, slug,) and burning in a specific pattern (close range phenomenon only)
- The internal track,

These characteristics of the firearm injuries discriminate them from the injuries caused by other weapons.

8.12.5.2 Nature of Firearms

The wounds indicate the nature of firearms used. The nature of injuries from common firearms is given below:

- ***Pistol and Revolver Injuries***

  Pistols and revolvers fire low velocity projectiles, varying from 200-400 m/s. The entrance hole and the track correspond roughly to the diameter of the projectile. The exit wound, when formed have usually greater dimensions.

  Usually, jacketed bullets are used in pistols and both lead and jacketed bullets are used in revolvers. Jacketed bullet, when fired from close range, often form exit wounds. Sometimes, due to bone obstruction the bullet remains in the body. Lead bullets seldom form exit wounds.

- ***Rifle Injuries***

  Rifles projectiles have high muzzle/striking velocities. They cause devastating 'explosive' wounds. The projectiles often fragment or fly away after piercing the body.

- ***Shotgun Injuries***

  The range of fire greatly influences the nature of the shotgun injuries. Contact or near contact wounds look like explosions. Close range shots, up to about three metres, give rat-holes varying in diameter from about 2 to 6 centimetres. From about 2 to 10 metres the projectiles may form a rat-hole surrounded by individual pellet holes. Beyond 10 metres most of the shots form separate holes. The buckshot may separate earlier. For example, LG shots may give individual separate holes from a range of about 2 metres.

  The spread area of the pellets varies with the range and the choke characteristics of the involved gun.

  Ordinarily, the shotguns projectiles do not form exit wounds except when buck shots are fired from close ranges.

- ***Muzzle-loading Firearm Injuries***

  The muzzle-loading shotgun is still used in India. However, their use is diminishing. The user himself loads the gun. He varies the charge from shot to shot. Therefore, there is no specific injury pattern in muzzle- loader firing. The nature of the injury depends upon the quality and the quantity of the powder and the projectile charges, adequate wading, correct packing of the charge and proper initiation. The end result may be as good as in a standard shotgun or as poor or poorer than in a zip gun (improvised firearm).

- ***Improvised (Zip) Guns Injuries***

  Improvised firearms vary from one firearm to another. They give no specific injury patterns. No generalizations are, therefore, possible.

8.12.5.3 Miscellaneous

- **Post-mortem or Ante-mortem Injuries**

  It is necessary, in some cases, to establish that a given firearm injury is ante-mortem to refute the defence allegation that the given firearm injury is post-mortem, introduced by the prosecution to strengthen the evidence against the suspect.

  Ante-mortem injuries bleed profusely while post-mortem injuries bleed little unless some blood vessel is punctured. If the injuries are made on a dead body which is still hot, it may bleed somewhat but not to the extent when the injury is on a live person.

- ***Fatal Injuries***

  A firearm injury is often fatal due to haemorrhage, shock or other complications. However, if a vital part (brain, heart, spinal cord or aorta) is not affected and the injury is attended to immediately and there is no serious loss of blood the person may survive.

- ***Extraordinary Acts***

  A victim sometimes performs certain extraordinary acts before he collapses. The defence in such cases argues that the victim must have died of some cause other than the firearm injury, because the shot should have incapacitated the victim immediately. This argument is not justified. The human body (and mind) sometimes behave in an extraordinary way. It can perform acts, which are considered improbable on medical considerations.

- ***Age of Injuries***

  Determination of the age of the injuries is useful in some cases. It is ascertained from:

  1. The quantity of bloodshed when the injury is still bleeding.
  2. The inflammation or putrefaction of the injury.
  3. The extent of healing. The treatment given has important bearing on the extent of healing.

  Only an experienced medico-legal expert can estimate the approximate age of the injuries.

8.13 RECONSTRUCTIONS

WHY SHOOTING ACCIDENTS?

1. Defective firearms: Safety catch out of order
2. Light trigger pull
3. Negligence: Keeping the firearm loaded/cocked at home
4. Allowing the uninitiated to handle the loaded firearm
5. Letting the children play with the loaded gun
6. Firing the bullet at ricochet prone angles/directions; Ricochet bullets have enough remaining velocities to kill/injure persons
7. Scuffle: trying to snatch a loaded firearm
8. Accidental fall of a loaded firearm on hard ground; hammer taking the impact
9. Kids (under 5) taking a firearm as toy and playing with it, may cause accidents
10. Youngsters, to show off their prowess, handle guns carelessly and cause accident
11. In Northern India, drunken people fire guns to celebrate functions (marriage!), and cause accidental deaths
12. In hunting, hunter often cocks the firearm beforehand, which may get entangled with flora of the jungle and go off, killing/injuring him/other.
13. Cleaning a loaded firearm may cause accident

The reconstruction of the crime, sequence of events/*modus operandi* and verification of versions (prosecution version: defence version: correct version!) in a shooting case is an increasingly important task in Forensic Ballistics. The defence often attempts to discredit the prosecution version and *vice versa.* As the circumstances of each case vary, only general principles and the basic factors, which help to verify the version, are considered here.

8.13.1 Basics

All reconstructions of the shooting incident must:—

1. Be based upon legally valid evidence
2. Be consistent with the involved firearm/ammunition ballistics
3. Be in consonance with the injuries on the victim(s)
4. Be consistent with the scientific/circumstantial/ medical evidence/ witness accounts. Variance, if any, is explicable.
5. Explain/link / account for genuine observed facts.
6. Account for the presence/ role of the seized clues (firearm fired ammunition)
7. Establish irrefutable linkage/de-linkage of the involved clues (firearm with the injuries/damage to the victim, the holes/dents at the scene, the fired ammunition)
8. Be consistent with the IO's findings.
9. Be consistent with the evidence in the documentation (video tape/photographs/ sketches) of the scene.

Reconstruction of events in a shooting case is an important task of a firearm expert. He collects the data, theorises the various models in which the occurrence could take place, checks their compatibility with the data and other evidence, takes into accounts the alternatives/negative evidence. He arrives at the most plausible reconstruction. He thrashes it with colleagues, hones it and finalises the reconstruction in the form of a report with data, illustrations, sketches and other needed graphics.

> ***"It is futile to theorise without proper data."***
> ***Conan Doyle/Sherlock Holmes***

An experienced and conscientious Forensic Expert follows a systematic drill to gather the data for a worthwhile reconstruction relating to a shooting incident:

1. **Visit the crime scene;** the Forensic Expert visits the shooting scene to study its topography and layout of the victim, evidentiary clues and other objects thereon.
2. **Crime scene documentation;** he studies/appraises the IO's documentation [videograph/photographs/ sketches/ textual description/eyewitness(es) accounts].
3. **Photographs;** he examines the photographs of the Crime Scene /victim/injuries, taken soon after the occurrence.
4. **Post-mortem/Medico-legal report;** he digests the contents of the Post-mortem/ Medico-legal report. He may contact the medico-legal expert to clarify doubts/ ambiguities/lacunae and to get additional information if required.
5. **Clothes of the victim;** he evaluates the evidence (projectile holes, propellant residues, marks of struggle, stains, cuts, foreign material). Sometimes even the projectiles or their fragments are found entangled in the clothes.

6. **Firearms;** he examines the firearm to find out whether it is in working order, it is defective, or it is prone to accident. He checks the trigger pull that may be too low. Likewise, barrel check may reveal it to be too loose or choked.
7. **Ammunition;** it is checked for its fire worthiness, its compatibility with the firearm; whether it standard or homemade ammunition; whether it is fired or not; whether the killer bullet is a ricocheted bullet; All have a profound effect on reconstruction.
8. **Basic ballistics facts;** different firearms have different ballistics. Are the wounding phenomena observed in the given crime compatible with the suspected firearm ballistics? Are the injuries from the aiming range?
9. **Demonstration;** once the expert has the data, he reconstructs the shooting event and demonstrates it to his colleagues or to court. Computer graphics, virtual reality and recreation of the occurrence through animation have greatly improved the effectiveness of demonstration the occurrence.
10. **Court's participation;** it is essential. The judge is the final authority to appraise the reconstruction. A seasoned expert involves (enropes) the whole court in the demonstration/ reconstruction.
11. **Expert's performance;** the expert is the prima donna/ the star performer of the reconstruction of the occurrence. He must:
    1) Possess high order of expertise,
    2) Have both qualitative and quantitative experience,
    3) Be a man of science,
    4) Not succumb to conformational syndrome,
    5) Create confidence in the mind of the court of his competency/honesty,
    6) Base the reconstruction on experiments/observations/ precedents and their logical inferences/conclusions.
    7) Present the reconstruction in simple, precise and concise language; supported with data, reasons and illustrations.

Homicide Indicators

1. **Wounds located at non-suicidal sites, are most likely homicidal**
2. **Firing range, beyond powder range is indicative of homicide**
3. **Angle of the shot incompatible with self-infliction/accident**
4. **Multiple shots indicative of homicide**
5. **Presence of gunpowder residue on the suspect's hands/clothes/face indicative of homicide**
6. **Absence of GSR on the hands of the dead indicates homicide**
7. **Shot through clothing indicate murder**
8. **Entanglement of the victim in Zun/Zamin/zar (female/ land/property/ money/wealth) leads to murder**
9. **Revenge lead to murder**
10. **Struggle at the scene indicate murder**

11. Vendetta leads to murder
12. Religious fanaticism is responsible for many murders
13. Class/ faction fights lead to murders
14. Absence of evidence for suicide/accident indicates homicide

8.13.2 The Scene

The scene of occurrence is one of most important sources of reconstruction evidence. For this purpose:

1) He visits the crime scene, even after long the incident.
2) He studies the IO's documentation to get a complete description of the scene with sketches, photographs and video film.
3) He studies the statements of the eyewitnesses.
4) He contacts the IO for more details/clarifications, if need be.

In a case, a girl was killed by a boy in the house of the later. As the two belong to different religions, there was at once a great agitation and danger of communal riots. Preliminary police investigation, however, led to the view that it was probably an accident. Immediate proof, however, was needed. The public had to be convinced one way or the other. The main inexplicable points relating to firearm evidence, apparently incompatible with the"accident" version were:

- *The left side of the face was completely blown off. It did not look like a firearm injury at all. It looked as if the face has been either blown off with an explosive or battered with some heavy irregular instrument.*
- *The body of the girl was found in a room whereas some marks of projectiles were found outside the room on a wall, almost ninety degrees to the alleged line of fire.*

The author was flown to the site. He started investigations:

- *The head of the deceased girl was X-rayed. Most of the charge of a 12-bore cartridge was located inside the head. The public believed that culprit had battered the face of the victim brutally with a blunt weapon.*
- *The pattern of bloodstains, flesh and bone pieces, fired wads was significant. The cushion wad, covered with blood, skin and flesh was found stuck to the wall on the backside of the victim. It was at the same height as of the injuries on the face of the victim. Some pellets had also fallen on the floor after striking the hind wall.*

Some pellets were found outside the room. It was found they were also carrying blood stains. How did they go out, was also clarified. The victim was standing near a window. The pellets after striking the jawbone were deflected and went out through the window. The tell-tale marks produced by blood, bone and skin pieces indicated the path of flight of the potential troublemaker projectiles.

The reconstruction satisfied the public that it was not a case of brutal murder. (CH)

8.13.3 Photographs of the Scene

The photographs of the scene taken soon after the occurrence, are a potent source of information for the reconstruction of a shooting incident.

In an alleged suicide the actual examination of the articles at the scene and the photographs showed following discrepancies in firearm evidence:

The projectile after coming out of the body was resting near the muzzle of the firearm. Later a dent, the bullet had made, was discovered elsewhere.

The firearm (a revolver) allegedly grasped in cadaveric spasm in the hand was found to have a live cartridge at 12 O'clock. There should have been a fired shell, instead, in this position.

The photographs and material exhibit records completely contradicted the suicide theory of death. (CH)

8.13.4 Victim's Clothes

The clothes of the deceased or the injured provide important evidence, which is helpful in the reconstruction of the incident.

In a murder trial, the prosecution story alleged that two persons fired one shot each. One shot was fired from the backside and the other from the right side.

The medico-legal expert found 3 injuries on the deceased. One was on the left side one on the right side and one on the back (post-mortem report). The doctor had not discriminated entrance and exit wounds. It was therefore, decided to examine the clothes. There was only one hole on the back of the shirt. GSR around the hole indicated it was entry hole. It discredited the prosecution version of two shots fired by two culprits. (CH)

8.13.5 Medico-legal Report

The medico-legal report along with the statement of the doctor with cross-examination, re-examination, if available, is studied carefully.

A dead body was found in a jungle. The body was identified. The deceased had gone on the previous day for hunting.

The body was found to have one gunshot injury on the upper right part of the abdomen just above the hip bone. The direction of the injury was steeply upward and inward, towards left. The medico-legal expert had found the entire charge of a 12 bore cartridge under the skin of the left arm pit.

All possible alternatives were considered, and it was found that the injury could be caused only in two positions. In one, the gun could have gone off when the person was standing with his gun resting on the ground on the right-hand side and the muzzle touching the situs of the injury. In second position, the injury could be caused when the person was lying on the ground and a second person had to fire at him, also from a lying position. As the second alternative was illogical, only the first one could have actually happened.

The gun was found prone to accident. The contention of the relatives of the deceased that the victim was murdered was rejected. (CH)

A medico-legal report without diagrams is incomplete. The diagram should be got prepared from the medico-legal expert who had carried out the medico-legal examination.

Alternatively, the help of some other Medico-legal expert who has sufficient experience of the work is obtained to prepare the diagrams.

If the Medico-legal expert had taken radiographs to locate the projectiles and the bone fractures, the radiograph or the copies of the radiographs is also obtained/studied.

8.13.6 Arms and Ammunition

The firearm and the recovered ammunition, live and fired, are invariably examined. After the theoretical reconstruction, experimental reconstruction is carried out using the same arm and similar ammunition. It not only confirms the expert's thesis, it also helps to convince the court.

In an alleged suicide case, the police recovered a .32 revolver from the scene of occurrence. The bullet recovered from the body of the victim was of .38 calibre. It had not been fired from the firearm. (CH)

In another case, a felt cushion wad was recovered from the body. The cartridge case, allegedly recovered from the scene of occurrence, was made in Indian Ordnance Factory, which did not use felt wads in the manufacture of their cartridges. (CH)

Once a 16 bore wad was recovered from the body of the deceased; while a 12 bore gun was suspected to have been used. (CH)

In a murder trial the deceased had suffered a number of injuries. There were three skin-deep abrasions on the left shoulder, one rat-hole on the cheek near the ear and one through and through injury below the left jaw. In addition, there was another injury on the chest about 2 cm in diameter. The Medico-legal expert in cross-examination indicated that these injuries had been caused by four shots. According to eyewitnesses the culprit had fired only four shots. It was, therefore, essential to establish whether the injuries were caused by two or four shots.

The high court referred the case to the author. He carefully studied the pattern and direction of injuries, examined the clothes worn by the deceased and the projectile charge extracted from the body. The study revealed that the injury on the chest was caused by one shot and the other injuries could be caused by one additional shot if the cartridge containing an LG shots was fired when the head of the victim was turned towards the left. The pattern of injuries was duplicated from one to about three metres on an inanimate model. The demonstration of the reconstruction presented to the court. The High Court accepted the presentation. (CH)

The accused appealed against the High Court order. The Supreme Court also accepted the reconstruction with the following remarks:

We have given our most careful consideration to the medical evidence in the light of the above quoted authorities on medical jurisprudence, the deposition of Dr. B.R. Sharma and the contention of Mr. Sibal and our conclusion is that the latter cannot prevail and that the opinion of the ballistic expert, substantially in accord as it is with the said authorities, deserves acceptance.

The conviction/sentence was maintained.[16] *(CH)*

In a case, a person started examining a loaded self-loading pistol. It was an open space. The person pressed the trigger once or twice. The firearm did not go off. In the meanwhile, the owner who was bathing nearby, saw the man handling the pistol. He came running and started snatching the pistol. It went off and killed the owner.

The police suspected murder. However, they sent the firearm to the author. He found it defective. The firearm should go off only when the safety catch is pressed in the grip and the trigger is pulled. In this case, the accused pulled the trigger without pressing the safety. While snatching the pistol, the safety grip was accidentally pressed. The pistol went off, though the trigger was not pressed. Normally it should not have happened if the weapon were not defective.

The plea of the accused, of accidental fire, was accepted (CH)

8.13.7 Basic Ballistics

Basic ballistics of the firearm and ammunition in question should be known.

16. It is a reported case: *Om Parkash v state of Haryana*, AIR 1971 SC 1388.

Suicide Indicators

1. **Choice of the suicide site: closed bedroom/bathroom**
2. **The shooting scene: mainly undisturbed, bullet marks may exist, if it exits**
3. **Presence of firearm in prone position: around hand, near/on the body**
4. **Injury at preferential suicidal sites: temple, mouth, forehead, under chin, chest**
5. **Contact/ near contact/powder range firing; ejecta in/around the wound: contact suicidal shots in over 97.9 % cases; powder range shots in about 2 % Cases;(US Stats)**
6. **Presence of burning, blackening, tattooing, muzzle imprint, dirt/contusion /abrasion rings**
7. **GSR on the hand (that fired the gun), face, clothes**
8. **Suicide note (in about 30 % cases)**
9. **Facing serious social problem: financial/ familial/ business or social problems including sexual harassment, kidnapping, and the like**
10. **Health problem/fatal disease/incapacitation/loneliness/alcoholic/drug addict**
11. **Psychological autopsy: suicide inducing environment: family (violence/strain), office worries, quarrelsome neighbour or suicidal tendencies**

8.14 TIME OF FIRE

It is useful to know when a particular firearm was discharged. However, it is difficult to fix the correct time. The following observations are helpful.

8.14.1 Gunpowder Residue

In black powder ammunition, discharge residues undergo chemical changes with the passage of time. It is possible to form a rough estimate of the time of fire from those changes.

Hydrogen sulphide gas formed is detectable in the barrel for about twenty-four hours, provided the breech end of the firearm is not opened and the muzzle is capped. Sodium sulphide formed changes into sodium sulphite. The change takes place in three to four days. Sodium sulphite, ultimately, changes into sulphate. The change is complete in about seven days.

8.14.2 Carbon Monoxide

If carbon monoxide is detected in the barrel, it is a sure sign of recent fire. The gas can be detected only for a few hours. If the breech end is opened or the barrel is blown through, no gas is left. Long barrelled firearms retain the gas for longer intervals.

8.14.3 Mercury

Mercury fulminate is/was used in cartridge primers. On firing, it releases elementary Mercury is released. It is deposited in the barrel. It evaporates slowly. Its qualitative and quantitative estimation, spectrographically; gives some idea about the time of the fire. The weather conditions and the way the firearm is kept affect the results. In practice, the method is problematic.

Mercury fulminate is used in most of the cartridges made in India.

8.14.4 Bloodstains and Flesh

Bloodstains and flesh may sometimes be found on firearms in contact or near contact wounds. The age of the stains or flesh can indirectly indicate the time of the fire.

8.14.5 Rust

If a barrel is not cleaned and oiled after firing, it starts rusting. The extent of rusting depends upon the nature of the steel, the nature of powder, the cap composition, the weather conditions (temperature and humidity) and the length of time, it has been allowed to rust. The amount of rust may, therefore, permit rough estimation of the time of the fire. The humidity and temperature of the atmosphere and presence of catalysts (like potassium/sodium salts) which are present in powder residues affect the rate of rusting tremendously. They are taken into consideration for correct conclusions.

8.14.6 Dust

The amount of dust deposit gives an idea when the firearm was used last. In a recently fired firearm there should be no dust deposit. The weather conditions and the way the firearm is kept, affect the amount of dust deposited.

8.14.7 Nitrite Variations

The gunshot residues of smokeless powder left in the firing process (in barrels, in cartridge cases and on bullets and pellets) were investigated in the author's laboratory. The residues have been found to contain an unstable compound which gives nitrite test. The amount of available nitrite decreases with the passage of time. It is detected with the usual *diazo* reaction and the variations in its quantity are estimated through the variations of colour intensities of the dye formed. It is possible, with this technique, to estimate the time of fire within certain limitations. It is hoped that the technique proves useful to date the firing of the guns, the cartridges and even the bullets. This may indirectly lead to determine the time of death in cases involving firearms.

8.15 MUZZLE-LOADING FIREARMS

Muzzle-loading firearms are a vanishing species of firearms. But they are still available in rural areas of India and are used in crimes sometimes. The following evaluations are possible when they are used:

8.15.1 Percussion Caps

Percussion caps are normally blown to small pieces. In some cases, however, they may retain identifiable marks. Test percussion caps are fired, without powder and projectile charge. The hammer marks thus obtained, are studied and matched in the usual way.

8.15.2 Projectile Charge

In muzzle-loading guns, homemade projectiles are used usually. The lead of the crime charge is analysed for trace elemental profiles. The profile is compared with similar profile obtained from the lead recovered from the house of the accused. These trace element profiles permit the linkage/non-linkage of the projectiles with the suspected source .

If the buck shots are the crime projectiles, they carry mould marks. They are compared with specimen marks on similar buckshot recovered from the suspect or created from the mould he possess. Comparison of the marks may link/delink the suspect with the shooting.

> *A few years ago, a ball was recovered from the body of the deceased. It was homemade ball. Some balls and the mould were recovered from the house of one of the suspects. The mould marks found on the incriminating ball when compared with the marks on the test moulds prepared from the mould. It established the common source of crime and test balls. (CH)*

Sometimes the ball may carry ram rod marks. Comparison of the marks with the test marks taken on lead or plasticine may identify the common source.

8.15.3 Wads

Rags or pieces of paper are used as wads in muzzle-loading guns. The wads fall at the scene of occurrence. Comparison of the rags or the pieces of paper with those recovered from the house of the suspect may sometimes indicate the common source of origin.

8.15.4 Powder Charge

Gunpowder is used as a propellant in muzzle-loading guns in India. The examination of the gunpowder recovered from the scene and from the suspect may indicate common source.

8.16 IMPROVISED FIREARMS

The improvised firearms are also known as *Country-made Firearms, Homemade Firearms, Pipe-guns, Zip guns*. These firearms are made by an ordinary blacksmith to no particular specifications, nor any standard raw material is used in their manufacture. These weapons have a short span of life and most of them are extremely dangerous.

> ***The simplest improvised firearm, used in a crime case, was an iron tube. A .22 cartridge was fixed at one end. Its base was hammered. The bullet flew from the other end and hit the victim.***

The word "**improvised**" indicates the correct nature of the firearm. They are also called **"country-made firearms"**. Both the names: "country-made" and "'improvised" are being used in this country interchangeably.

The improvised firearms are made from readily available materials, usually by a local blacksmith. The demand for the improvised firearms is so much that many gangs of criminals manufacture improvised firearms on commercial scale[17]. The demand is increasing.

8.16.1 Importance

The firearms are great equalizers of physically the weak and strong persons. They confer a superiority to its possessor over those who do not possess them. They are, therefore, frequently used in the commission of crime, to settle scores with the opponents or to cow down those who do not possess firearms, or to frighten the victim(s) in crime situations. As the legal possession and legal trade is highly restricted, the needy goes in for them.

The Abuse of improvised firearm varies from state to state, from about 25% to over 50%. Therefore, these improvised firearms, are of special interest in criminal investigation and trials.

17. Due to the Indian government's stringent licensing policy and strict control on manufacture/sale of standard firearms, the manufacture and trade in improvised firearms is flourishing.

The improvised firearms provide clinching linking evidence in most of the cases. Formerly, only limited evaluations of the evidence were possible. Now with extensive research, their evidentiary value is .more or less, at par with that of standard firearms.

8.16.2 Classification

Improvised firearms are classified with reference to the ammunition used in them. Thus, we have 12 bore firearms. They fire 12 bore cartridges. Likewise, .303 firearms fire .303 ammunition. As the ammunition of the other types of firearm is not easily available and is very costly, improvised firearms for the other bores or calibres are rare, though sometimes revolvers of .32 and .38 calibres are also met with.

The improvised firearms are also classified according to the manner in which they are fired. Thus, we have the shoulder firearms or the handguns. The improvised handguns (often called *kattas* in India) are used more frequently, probably of their convenient size.

The improvised firearms, by and large, have smooth bore barrels, though some handguns do carry rifling, often in a crude form, more to satisfy the purchaser than to improve the ballistics of the arm and ammunition.

8.16.3 Parts

Improvised firearms have the usual parts:

1. Barrel
2. Chamber
2. Action
3. Lock.

8.16.3.1 Barrel

Improvised firearms have non-standard barrels. They are often pieces of iron or steel pipe used in the sanitary or electrical work or they may be pieces of barrels of discarded barrels of older firearms. They are seldom manufactured by boring of the steel rods. The length of the barrel varies from about 10 centimetres to 25 centimetres in the case of handguns, and it is about 60 centimetres in the shoulder firearms. The following points are noteworthy about the barrels in such guns:

1. The diameter of the bore/calibre seldom corresponds to that of a standard firearm. It varies from 1 cm to 2.5 cm usually. It may even vary from one point to another in the same barrel.
2. The bore surface is seldom smooth. It may have ridges and valleys, protrusions, pits,
3. The thickness of the barrel wall differs from one firearm to another.
4. The barrels often have a welded seam (to form a pipe made from a sheet) which is the weakest structural feature of the barrel.

The barrels of the improvised firearms, which are intended to fire .303 cartridges, have the following noteworthy characteristics:

1. There is usually no rifling in the barrel.
2. The diameter of the barrel varies from 7 to 13 mm. It is not uniform.
3. The barrel is usually thick but varies from firearm to firearm.
4. The bore surface is rough. It carries pits and protrusions, ridges and valleys.

The barrels of the other bores/calibre improvised firearms have similar.

The loose, rough and the non-uniform barrels are responsible for the varying ballistics performance of the ammunition from one shot to another.

Improper materials, the presence of joints, protrusions, pits, in the barrels make these weapons highly dangerous for the user.

Interestingly, the weapon becomes less dangerous to the victim as the ammunition does not acquire the intended velocities. Both the aim and the range suffer drastically. However, they remain highly dangerous at close ranges, at which they are used.

8.16.3.2 Chamber

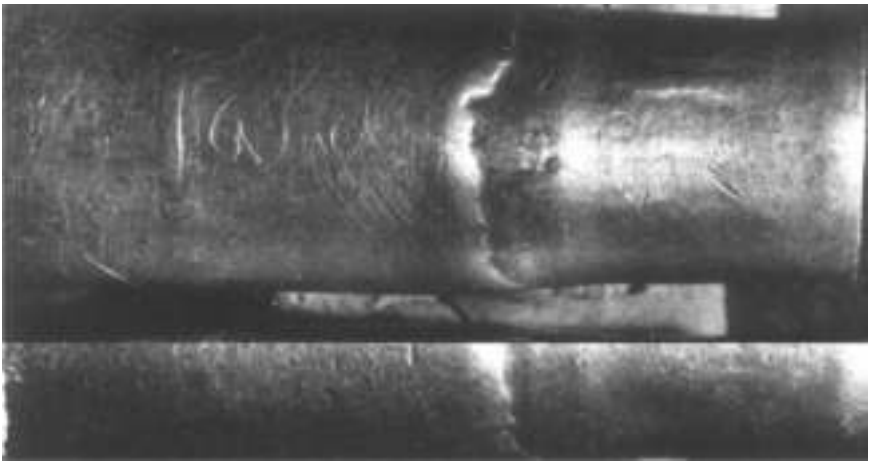

Fig. 8.32

Short chamber of an improvised. 303 pistol, created chamber edge (leed) marks on the fired cartridges, which permitted identifications of the common source

The improvised firearms usually do not have specially made chambers. In most of them the barrel end serves as a chamber. There is no separating structure to mark the end of the chamber.

If the bore diameter is more than the diameter of the base diameter of the cartridge, a special arrangement (some sort of adapter is attached to the chamber end) is made to prevent slippage of the cartridge into the barrel. In very crude firearms, the slippage is prevented by wrapping a piece of cloth or paper around the cartridge tube.

The chambers of improvised firearms, if they exist, do not have the proper dimensions, nor do they have any arrangement for seating the cartridge correctly. Consequently, the cartridge often rests loosely in the chamber, which is an important factor for varying ballistics given by the same firearm from one shot to another.

The loose chambers-fit causes cartridge bursts. A tight chamber imprints the chamber irregularities on the cartridge tube. The imprinted chamber marks facilitate the linage of the firearm and the cartridge case. These assume importance in cases where firing pin or breach face mark are missing. Here percussion cap is blown off and/or backward thrust is not powerful enough to register the breech face marks.

8.16.3.3 Action

The hammer, trigger, and the firing pin (striker) are the important parts of the action mechanism. Often the hammer is cocked manually. It is held in the cocked position through a spring mechanism. When the trigger is pressed, it releases the hammer and the spring makes the hammer strike the firing pin with a considerable force. The firing pin, in turn, strikes the percussion cap to explode (fire) the cartridge.

The main distinguishing characteristics of the action are:

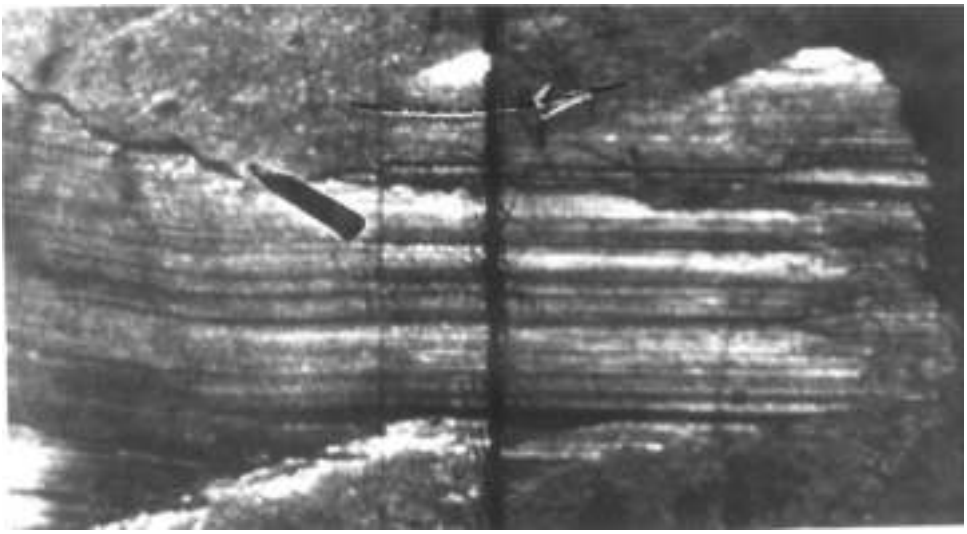

Fig. 8.33

The firing pin of an improvised firearm would not retract. On opening the breech,it scraped the base. Corresponding scrape marks provided the identification

1. The firing pin is more or less a headless nail. In some cases, the head (of the nail) was also observed. It is propelled forward by the striking hammer and kept pushed in, in its new position. Often it is slightly longer than needed and pierces the percussion cap. Thus, gases leak backward. This may reduce the forward propulsive forces somewhat in some cases.
2. The piercing of the cap complicates the identification of the firing pin mark on the cartridge case in respect of the firearm containing the firing pin. However, backward leakage of gases, through the pierced hole, permits more forceful impact of the base of the cartridge with the breech face and ensures better breech face marks on to the base of the cartridge. As the breech face of the improvised firearm is crudely finished, it carries numerous irregularities which leave their marks on the cartridge case. They facilitate identification of the fired cartridge.
3. In most of the cases the firing pin continues to be pressed against the cartridge as there is no spring action to take it back. In such cases, when the cartridge is being taken out, the protruding firing pin may scrape the percussion cap and base of the cartridge to give scrape marks which provide ample evidence to link the fired cartridges with the firearm which fired them.

It is against this background that the identification of a fired cartridge in respect of the involved improvised firearm is often easy.

4. The firing pin in an improvised firearm can be easily replaced. The clever criminals have at times replaced the firing pin or mutilated its original surface characteristics. The fraud does not help much. The breech face marks provide the necessary identification data.

In an interesting case, a criminal, after killing his victim with a gun, went to a blacksmith and got the firing pin replaced. He also obtained a receipt from the blacksmith for the services rendered. Later, the police recovered the firearm from the suspect. It was sealed in the presence of the accused (culprit) and a magistrate and sent to the laboratory.

The author examined the exhibits. He found the difference in the firing pin mark. But there was ample identifying feature in the breech face marks. He linked the cartridge case recovered from the scene with the recovered firearm.

At the trial, the defence counsel produced the receipt. It was dated after the date of murder but before the date of its seizure. The prosecution counsel was upset.

The ballistics expert was called to clarify. The clarification was simple. The firing pin marks differed on the test and crime cartridge cases, but there was still ample evidence, in the form of breech face marks, to link the firearm with the crime cartridge. He demonstrated the difference in firing pin marks and correspondence in the breech face marks through photographs. The court understood the fraudulent replacement of the firing pin.

The fraud of replacement of the firing pin did not succeed/help. (CH)

8.16.3.4 Lock

The locking systems of the improvised firearms are notoriously unreliable. There is no proper barrel-stock coupling system. The locking device is often a nail-hole arrangement. In many the locking is unsafe. Often there is a gap between the breech block and the barrel. The gap promotes cartridge bursts.

8.16.4 Firing Process

The poor construction of firearms affects the firing process in the following ways:

1. A longer and non-retractable firing pin pierces the percussion cap of the cartridge. It adversely affects the initiation of the powder charge, modifying the intended ballistics of the ammunition.
2. The gap between the breech face and base of the cartridge allows the backward movement of the cartridge. Sometimes the cartridge bursts and seriously affects the development of adequate pressure, which in turn affects both the aim and the range. The extent of the effect varies from firearm to firearm and even from one shot to another shot. Metallic pieces may fly when a cartridge bursts, injuring the shooter or bystanders.
3. Over-sized chambers promote lateral expansion which affects the development of a forward pressure. In some cases, the cartridge bursts, which seriously affects the ballistics of the ammunition.
4. An oversized barrel bore allows gases to escape from the sides. It affects the ballistics of the process in the following ways:—
    1. *The gases escaping from the sides do not contribute towards the velocity of the projectiles. The kinetic energy of the projectiles is reduced.*

2. The escaping gases do not build up the pressure. It gives incomplete combustion. It reduces the velocity of the projectiles.
3. The projectiles, due to the above reasons, have lower wounding power.

5. The oversized bore prevents a continuous bullet-bore contact. The random contact may or may not imprint adequate contact marks on the bullet, which hinder bullet-barrel linkage.
6. In undersized bore barrel, the firearm may burst, but it seldom happens. It is There are many reasons. They include incomplete combustion, backward movement of the cartridge, punctured percussion cap, bursting of the cartridge itself.
7. The combustion of the powder charge of the ammunition meant for a long-barrelled firearm is not complete due to short-barrel of the improvised firearm. Consequently, the semi-burnt and unburned powder particles are ejected in considerable amounts along with the projectiles and other ejecta. They travel to longer distances and give a false idea of the range of fire.
8. The incomplete combustion creates a lesser amount of gases and pressure. The projectiles, therefore, do not acquire standard velocities or striking energies. The wounding power of the projectile fired from an improvised firearm is reduced considerably.
9. The improvised firearms do not have rifling. The projectiles fired from them, therefore, do not spin. The aim and range are, consequently, seriously affected, even when the bullets fired are of standard rifle ammunition.
10. As the semi-burnt and unburned powder particles are also hurled along with the other ejecta, the powder range may, thus, increase. The data for powder range of standard firearms do not hold good for the improvised firearms.
11. The rough bore surface may scrape the metal particles from the projectiles. They travel to a greater distance than those in standard firearms and may give false estimates of the range, if the data of the standard firearms is used for the range determination.
12. In an excessively large bore, the bullet may get bent due to striking against the barrel walls at an angle. The bent bullet may mislead the investigator as the bent bullets are also met with in ricochet.
13. In both oversized and undersized bore barrels, the wads may get damaged or marked in a particular fashion. The characteristic change may help the wad-firearm linkage.

8.16.5 Evaluation

The evaluation of evidentiary clues in the improvised firearm follows the usual pattern for corresponding clues in the standard firearms.

8.17 MISCELLANEOUS

8.17.1 Freak Firearms

Freak firearms do not conform to standard firearms. They may look like some innocent object. Freak firearms with the shapes of a fountain pen, walking stick, umbrella, walking stick have been made. The basic requirements of a firearm, *i.e.,* a barrel and a firing mechanism are present in all freak firearms. They fire standard or specially made ammunition.

Fig. 8.34

Cartridges burst on tubular part in defective make-shift firearms.
The burst pattern are similar

8.17.2 Toy Firearms

Toy Firearms look like standard firearms, but they do not fire standard ammunition. They fire blank cartridges or do not fire any cartridge. The firearms are used by children as toys, by actors on stage in theatrical performances, or they are used to frighten animals or human beings with or without firing blank cartridges.

8.17.3 Penetration Power

Penetration power of a firearm and its ammunition is measured from the penetration of the projectile in soft pinewood. Wooden planks of soft pine wood 2.54 centimetres (1.0 inch) thick are stacked parallel to one another at intervals of 2.54 centimetres (1.0 inch). The firearm is fired from a standard close range of 152.4 centimetres. The total thickness penetrated is measured.

Any air rifle or gun firing a projectile, which penetrates 2.54 centimetres (1 inch) of soft pine wood, needs a licence in India. Similarly, a handgun whose projectile, which penetrates 1.27 cm. (0.5 inch), needs a licence.

Penetration powers of air rifles vary. Those, which cross the above limits, need a licence. Others do not.

8.17.4 Range of Firearms

A firearm has a maximum range up to which its projectile can travel and then falls to the ground. It has a fatal range up to which if the projectile hits a vital part, it proves fatal. It has an effective range up to which a shooter can take aim and make a kill. These ranges are

given in the table below. They are only rough estimates. They vary with different firearms and ammunition even of the same type due to certain factors.

Table 8.3

Firearms ranges in Meters

Firearm	Effective	Dangerous	Maximum
Pistols and Revolvers	75	1000	2000
Service Rifles	1000	2000	>3000
Rifled slug/ball	200	1000	1000
Shotgun Buckshot)	75	500	800
Small pellets	75	150	300

8.17.5 Comparative Calibres

It is useful to know comparative calibres of firearms expressed in millimetres, in hundredths of an inch and in thousandths of an inch. The table below gives the equivalent measures

Table 8.4

Equivalent bore diameters

mm.	Hundredth of an inch	Thousand of an inch
5.6	.22	.220
6.35	.25	.250
6.5	.25	.250
7.0	.26	.260
7.5	.28	.280
7.62	.30	.300
7.63	.32	.320
7.65		
7.9	.32, .315	.320
8.0		
9.0	.35	.380
	.38	
10.35	.40	.445
10.75	.41	

mm.	Hundredth of an inch	Thousand of an inch
11.00	.44	.445
11.2	.45	.455
11.25 .45 .455		

8.17.6 Bore Diameters

Shotguns are designated by bore such as 12 bore, 16 bore and so on. They do not convey the diameter measurements. It is useful to know the bore number and their diameters.

Table 8.5

Bore diameters of various smooth bore shotguns

Bore or gauge	Diameter in inches	Diameter in centimetres
4	.935	2.67
6	.919	2.334
8	.835	2.121
10	.775	1.968
12	.729	1.852
14	.693	1.760
16	.662	1.682
18	.637	1.618
20	.615	1.562
24	.579	1.47

8.17.7 Conversion Barrels

In some firearms the same stock and action are used with ammunition and barrels of different calibres. Such a firearm can mislead the investigation. A criminal may use a 9 mm. barrel and ammunition for the commission of a crime. Later he fits a 7.63 mm. barrel with the firearm. The investigating officer would feel that the 7.63 mm. firearm would not fire 9 mm. ammunition. He, therefore, searches for some other firearm. He should be vigilant about such possibilities.

The fired cartridges, even though of different calibres, will bear similar marks from the firearm. The projectiles will bear different marks depending upon the barrel used.

8.18 PRESENTATION OF EVIDENCE[18]

A firearm expert who has the rank of an Assistant Director, Deputy Director or a Director of a Forensic Science Laboratory is not required to give evidence in person. Their reports are considered sufficient as evidence. Others have to appear in person to prove their reports.

18. Please see chapter 3 for detailed discussion. Also see chapter 22 of Author's Book ***Firearms in Criminal Investigation and Trials***. V Edn 2017. LexisNexis.

The expert giving the evidence, establishes himself as an expert, identifies the exhibits, he has examined in the laboratory, produces test exhibits prepared at the time of examination, gives experimental details, produces the data generated and presents the conclusions from the observations made by him. He illustrates his conclusions by photographs, illustrations, if necessary.

8.18.1 The Expert

An expert appearing in the court states his qualifications, training and experience, both in firearm examination and related fields. He describes his research work, paper published, and those read in seminars, conferences and meetings. The qualifications and experience are, thus, brought on record for the convenience of the court to decide whether the person giving evidence is an expert under section 45 of the Indian Evidence Act or not. Section 45 of the Indian Evidence Act requires that only those persons can give expert evidence who are especially skilled in the art or science, in which they are expressing their opinions. The data on the expert's qualifications/experience/research, of on record is to show that he is specially qualified to express the given opinion by all standard.

If the court, prosecution and the defence do not question the *bona fide* of the expert, his evidence is accepted as expert evidence.

I AM FORENSIC BALLISTICS EXPERT

1. **Academically, I am M Sc (Hons)/Ph. D in Chemistry.**
2. **I had training in New Scotland/other Home Office Laboratories, in Forensics in UK for 4 months.**
3. **I have handled thousands of Forensic Ballistics cases, over the past few decades and gave evidence in courts.**
4. **I have written/published about a hundred papers in Forensics including some on Forensic Ballistics.**
5. **I have written/published over half a dozen books on Forensics, including one on Forensic Ballistics (Fifth Ed.).**
6. **I have been teaching Forensics to one and all: Forensic science students/ medico-legal experts/judges/lawyers/ investigators and others.**
7. **I have participated in examinations/reconstructions of shooting scene/cases.**
8. **I have participated in forensics conferences/ meetings/ seminars/workshops.**

8.18.2 Exhibits

The expert gives opinion relating to exhibits already examined by him in his laboratory. He puts identification marks on the exhibits at the time of the examination. The identification marks are ordinarily the case number (of the police station or of the laboratory), his initials and date. If there are more than one exhibits of the same type, they are given different serial numbers. It is sometimes not possible to put identification marks on some exhibits as they are too small. In such cases, the expert checks the seals and contents of the packets, which carry the identification marks and testifies that it is the same packet in which the exhibits were returned.

The original packing cover in which the expert had received the exhibits is preserved and produced in the court. It is customary to send the cover along with the exhibits without destroying the seals thereon whenever possible

In a murder case, the prosecution produced a rifle in the court. When checked by the expert, the rifle did bear his initial but other identification marks did not tally. The police store (malkhana) official was contacted Correct rifle was brought. The rifle originally sent belonged to another case. (CH)

The cartridge cases are marked as C/l to C/n, the bullets as B/1 to B/n and firearms as FA/1 to FA/n. Other articles are marked A/1 to A/n.

8.18.3 Experimental Data

The expert gives briefly the details of the experiments and his observations. If he has prepared test exhibits, charts and photographs he produces them in the court. The expert also marks the test exhibits for future identification.

Court on Data

"It is difficult to see how reliance can be placed on the opinion unless it is supported by good reasons founded on the facts that warranted that opinion. If the reasons are good and convincing, and the factual data on the basis of which the opinion is formed, warrant the opinion, the court will rely on the opinion."

***Suleman Usman Memon v Gujarat,* 1961**

8.18.4 Illustrations

The firearm evidence is technical in nature. The observations are made through microscopes. Correct idea about these experiments cannot be given by verbal/textual description alone. These observations, are, therefore, illustrated through photographs for the convenience of the court and the counsels.

The findings of the expert are based upon multipronged examinations, tests and observations.

8.18.4.1 Cartridge Cases

A cartridge case may carry indentations or scrape marks. The indentation marks are illustrated with side by side photographs of crime and test cartridges, often taken through a comparison microscope on the same negative in juxtaposition. The photographs are pasted on a chart. The prominent indentations are marked thereon by drawing lines and giving corresponding numbers. Written notes, on the chart, explain them.

All types of indentations (firing pin, breech face, chamber, extractor and ejector) are illustrated in the same way.

Composite and superimposed photographs are produced sometimes, but they do not offer any superiority over the side-by-side photographs. In fact, the former is sometimes confusing to the nonprofessional. He cannot appreciate the small dimensional differences and some omissions/additions due to difference in the pressures developed in different cartridges fired from the same firearm.

The latter are illustrated like striation marks on bullets through composite photographs.

The use of photographic illustrations in the court is decreasing. A judge cannot distinguish whether a photograph is taken from a crime or a test projectile. The judge has to depend upon the expert. If the expert is dishonest, instead of comparing crime and test exhibits *inter se*, he

may use test exhibit in place of crime exhibit also and show matching data. The courts have realized this lacuna and now they do not insist upon photographic illustrations in firearm cases.

The expert should be brief and methodical. However, the brevity is not achieved at the cost of clarity.

8.18.4.2 Bullets

Bullet identifications are illustrated through a composite match taken through a comparison microscope. The prominent lines that show continuations across the dividing line from crime to test exhibits are sometimes numbered on the dividing line. The matched striations are usually from one groove or land. But if the number of lines is inadequate, more than one lands and/or grooves are matched and photographed.

The bullets are seldom illustrated through side-by-side photographs.

It is not possible to give the minimum points of similarities for a definite identification. In bullet identification, however, the continuation of about ten lines across the dividing line should be considered sufficient, provided, there is no characteristic divergence, which cannot be accounted for. The class characteristics (the diameter of the bullets, the number, direction and the dimensions of lands and grooves) must tally.

Fine lines in land or groove marks are more important than thick and deep scratches from the identification point of view.

A perfect duplication of marks is impossible even when the ammunition of the same make and batch is fired from the same firearm one after the other. Usually 70% line match indicates common source of origin and 25% or more non-matching line casts doubt on the common source.

8.18.4.3 Range

The patterns of scorching, blackening, tattooing, deposition of metal particles or of dispersion of pellets (in a shotgun) are illustrated through test patterns obtained on filter paper targets. Photographs of the pattern with scale are also prepared for permanent record.

8.18.5 Medical Evidence

A medico-legal expert gives his findings and opinion about firearm injuries in a proforma prescribed for post-mortem report. The report contains:

1. A complete description of the injuries with their positions, dimensions directions and skiagram of the injuries.
2. A sketch showing the positions/ sizes of the injuries and the internal track of the projectile(s)
3. Photographs of the injuries with scale, before and after cleaning
4. The nature, quantity and position of the foreign matter (GSR, projectiles and wads), recovered from the victim
5. Radiograph of projectiles in the body.
6. Existence/ absence of contributory cause(s) of death; for example, the person may be suffering from some disease.

An Old Adage

"A picture is better than a thousand words"

8.18.6 Language of the Experts

The expert is expected to bring the technical evidence to the level of a nonprofessional. He, therefore, uses simple, non-verbose, intelligible language. He avoids technical terms or complex theories in both the report and oral statement before the court. If he has to use technical terms, he explains them.

8.18.7 Cross-Examination

Cross-examination of an expert should aim at proving a point. Questions are framed carefully and the sequenced logically. Haphazard cross-examination may in fact damage the defence case.

The counsel has ordinarily the following aims in cross-examination.

Cross-examiner's Mantra

Be mild with the mild; shrewd with the crafty, confiding with the honest, merciful to the young, the frail and the fearful, rough to the ruffian and a thunderbolt to the liar. But never compromise your dignity.Focus fully so that virtue and truth triumphs.

Paul Brown: Harris, 1911

8.18.7.1 To Discredit the Expert Witness

Incompetency of an expert is established through questions relating to his qualifications, training, experience, research publications, membership of societies and participation in seminars, conferences and meetings on the subject.

It is futile to try to discredit a qualified, experienced and well-established expert. But it is criminal to accept an imposter as an expert.

A few years ago, one of the High Courts, rejected the expert evidence because:

1. *the "expert" had examined only one case in twelve years.*
2. *he did not carry out satisfactory tests,*
3. *he produced test exhibits so as to enable the court to come to its own conclusion. (CH)*

If the expert has a bad reputation, the evidence is discredited by quoting excerpts from previous judgments, where the evidence of the expert had not been believed and his honesty has been questioned. However, legally the evidence of even such an expert is evaluated properly for its value.

8.18.7.2 To Clarify Evidence

"Eye-witness accounts, medical reports and other physical evidence sometimes conflict with the firearm evidence. Clarification and elucidations in such cases prove extremely useful. The defence counsel may point out apparent discrepancies in different types of evidence.

8.18.7.3 To Prove Inadequacy

The evidence produced by an expert may be incomplete or insufficient. If the defence counsel detects these defects and brings them on record, the expert evidence is ignored. For example:

1. if test exhibits are not produced, the evidence is rejected,
2. if the expert is unable to identify the exhibits as the same as were examined in the laboratory, the evidence becomes suspect and rejected
3. if the report is bereft of data the court does not accept the *ipse dixit* of the expert.

8.18.7.4 Eliciting Additional Evidence

Sometimes the additional evidence relating to arms and ammunition may turn tables:

1. The variation in the manufacturers of the wad and the fired cartridge case brought an acquittal to an accused person.
2. The non-presence of the projectiles in the body and there being no exit wound proved fake nature of the injuries.

8.18.8 The Court's Role

An expert is to assist the court. He should give evidence without bias.

The court is to form its own opinion. It is, therefore, essential that the court gets clarification from the expert on all points which are important on which the expert can assist. The prosecution and the defence counsels are interested on only those aspects which help their case. Court is the main person to assess the truth. By intelligent questioning, it may not allow an expert to give complete facts.

It is the duty of the court to clarify the ambiguities through court questions.

> *In an interesting trial, the judge asked most of the questions (574 out of 825) from one doctor witness.*[19] *In the appeal, the appellant submitted that it was improper for the judge to take over the functions of the prosecution and defence counsels. The appellate court, however, rejected the contention and remarked that the judge is empowered to ask any number of questions, in any form relevant or irrelevant,* vide *section 165 of the Indian Evidence Act. (CH)*

A judge presides at a criminal trial not only to see that no innocent person is punished but also to see that no guilty person escapes punishment.

19. *Sunil Chandra Roy v State of West Bengal,* AIR I954 Cal 305.

ANNEXURE I

EVIDENCE INFORMATION CHART

Laboratory requirements

(1) Unmutilated, uncontaminated and undamaged evidentiary clues in their original form. (2) Adequate samples: Firearm, live ammunition, scene of occurrence (visits, photographs, sketches, description), clothes, medico-legal report.

Evidence	*Location*	*Collection & packing*	*Identification marks*	*Required samples*	*Possibilities*
1	2	3	4	5	6
Scene of occurrence	Ascertain from disturbance, marks and clues.	1. Photograph 2. Sketch. 3. Describe.	1. The photo data and the date on which the work was done. 2. All documents must be signed and witnessed (when possible).	Visit to the scene by an expert may be useful.	1. Determination of the real or fake scene. 2. Reconstruction to verify the version: suicide, murder, accident or self-defence.
Firearms: pistols, revolvers, rifles,shot-guns, muzzle-loaders, toy guns,air guns, improvised guns, automatic, semi-automatic firearms	1. Scene: floor, clothes, furniture. 2. Accused: person, residence, hide-out. 3. Victim. 4. Route.	1. Unload. Remove the detachable evidence. Process the fingerprints. 2. Encase in plastic envelope/sheet. 3. Seal in the cloth/ cloth-lined envelopes.	1. Initial with date, case number on the non-changeable and on all the inter-changeable parts. 2. Note the make and the serial number of the firearm. 3. Record the descrip-tion with a sketch.	——	Linkage with the fired ammunition period of fire, range, fire worthiness, accident prone, reconstructions, ownership through the serial numbers and the fingerprints.
Fired ammunition:bullets, cartridge cases, pellets, wads,fragments of project-iles, powder particles.	1. Scene: floor, fur-niture, walls, trees may be embedded. 2. Firearms: cases, stuck up bullets. 3. Victim: bullets and pellets inside, powder marks.	1. Collect all. 2. Encase in the plastic envelopes. 3. Seal in the cloth-lined envelopes. 4. Accused: on the person, at residence or at the testing place. 5. Previous owner.	1. Mark the shells in-side, bullet at baseor on ogival area, pellets on unmarked place. 2. Describe the exhibits.	1. Corresponding live and fired ammunition from the suspect. 2. Firearms.	1. Linkage with the firearm or the fired ammunition. 2. Number of shots. 3. Number of firearms. 4. Nature of the firearms. 5. Period of the fire.

Evidence	*Location*	*Collection & packing*	*Identification marks*	*Required samples*	*Possibilities*
1	2	3	4	5	6
Live ammunition: powder, cartridges, projectiles.	Scene, house or the hideouts of the accused.	1. Collect all. 2. Encase in plastic envelopes.	1. Write on cylindrical or tapering portion, avoiding damage any available evidence.	——	1. To establish whether prohibited or non-prohibited.
		3. Seal all in the non-to rattling containers.	2. Describe the ammu-nition (quantity, condition, make,)		2. Nature of the firearms. 3. Test ammunition.
Marks: projectile holes, powder marks, metallic deposits.	1. Victim: clothes, 2. Scene: floor, walls. Furniture. 3. Suspect: hands and clothes.	1. Photograph and collect marks bearing articles or their parts. 2. Seal.	1. Mark the clothes, cover. 2. Describe	Live ammunition and the firearms.	1. Cause. 2. Range. 3. Reconstructions. 4. Identification of the injuries, ammunition. 5. Angle of fire.
Traces: fingerprints, hair, fibres, blood, flesh and dust.	Attached with the fire-arm, cartridge cases, live ammunition, projectiles. (Also with the victim, the sus-pect and the scene).	1. Collect all. 2. Encase in the plastic envelopes. 3. Seal	1. Mark the envelope. 2. Describe the evidence.	Corresponding sam-pleas from the victim,accused, or from the scene.	Linkage of the firearm with the scene, the victim or the accused, reconstruction, range.

Evidence	*Location*	*Collection & packing*	*Identification marks*	*Required samples*	*Possibilities*
1	2	3	4	5	6
Firearm injuries:entrance, exit and internal wounds.	1. Person of the victim. 2. Apparel worn by the victim. 3. Objects hit at the scene. 4. Bystanders. 5. The culprit.	1. Photograph beforeand after cleaning. 2. Draw the graphic diagrams. 3. Differentiate the ent rance and the exit-wounds. 4. Collect the washing. Pack the washing in a spill-proof container. 5. Take the radiographs. 6. Describe fully (post-mortem or injury reports reports).	1. Initials with date and the case num-ber by the relevant persons. 2. Keep a copy of the report.	1. Arms, ammunition. 2. Clothes of the victim. 3. Photographs and the description of scene. 4. The doctor's statement 5. The victim's or the defence version.	1. Firearm injury. 2. Range. 3. One or more firearms. 4. Verification of the hypothesis: suicide, accident, murder, self defence.

Court requirements:

(1) Location of the evidence is established through photographs, sketches and description.

(2) Recovery of the evidence is proved authentic through witnesses.

(3) Relevancy, identity, integrity and intact chain of possession is proved from the time of recovery to the time of production in the court through the identification marks on the exhibits and through the transport of the exhibits in the sealed packets.

(4) The record of the discovery, recovery, possession and the description of the evidence is complete.

8.19 ADDITIONAL READINGS

1. B R Sharma, *Firearm in Criminal Investigation and Trials, 2017, LexisNexis, India*
2. Di Maio, V. *Gunshoot Wounds.* CRC Press New York.

8.20 SUPREME COURT: (21ST CENTURY CASES)

8.20.1 Entrance or Exit Wound[20]

Author's Summary

It is a case of murder by gunshot fire. There were 2 injuries. It was difficult to decide which was entry wound. The court on the basis of the size, inversion of margins and possibility of blast effect fixed the entry wound. Quoted authorities also.

Highlights italicised.

Relevant Extract (Verbatim)

Now we advert to the argument that the nature of injuries disclosed that the shot was fired while the injured was running and hit him from the back. It is mainly based on the medical evidence of first examining Dr. R.K. Mishra (P.W. 23) and the death summary Ex. P/38. In these, gluteal wound is mentioned as the entry wound. The Doctor has not given any reason for this opinion, but, the observation appears, *prima facie*, contradictory to the medical opinion expressed by eminent Doctors or experts in their textbooks of Medical jurisprudence.

The gluteal wound was larger in size, *i.e.*, 1" x 1" and had everted margin. The wound at the root of scrotum was smaller in size *i.e.*, ¾ " x ½" and had inverted margins. The area of injury to the muscle surrounding the scrotum for 3 ½", is of no importance as the skin and muscle in that area are in, more or less, loosely hanging state in a man. So the real size of the wound would be the spot where the stiff muscle starts. The size of which was ¾ "x ½" with inverted margin. A wound of entry is smaller in size than the wound of emergence. The wound of entry has inverted margins and wound of emergence has everted margins.

In *Modi's Medical Jurisprudence and Toxicology,* 21st Edn., at p 264 this opinion is mentioned:

> *The wound of entrance in distance shot is usually smaller than the projectile due to the elasticity of the skin, and round when the projectile strikes the body at a right angle and oval when it strikes the body obliquely. The edges of wound are inverted … The wound of entrance and its edges are irregular and everted … The edges of both the wounds of entrance and exit may be everted in fatty persons due to protrusion of fat in the wounds, and in decomposed bodies from the expansive action of the gases of putrefaction … ".*

In a book on the subject namely: "*Forensic Science in Criminal Investigation and Trials*" by Dr. B.R. Sharma, Ph.D., Director, Himachal State Forensic Science Laboratory, Shimla, at p 275, it is observed regarding wounds caused by firearm that

> *when velocity of a fired shot exceeds 600 metres per second and up to 1100 meter per second, it also causes wound of the nature of blast effect.*

Thus, the wound in the loose skin around the testicles of the deceased could be because of such effect also. At the same page it is also mentioned that if a projectile comes out of

20. *Vijay Singh v State of Madhya Pradesh,* 2000 Cr LJ 650.

the body the exit wound is larger than the entrance wound. So the laceration in that area after testicles of the size 3½ x 3" with irregular margin is explainable on this theory of blast effect of a fired shot. Even in Gaur's book namely *Fire Arms, Forensic, Ballastic, Forensic Chemistry and Criminal Jurisprudence* (2nd Edn., 1989) it is observed at p 82 that wound of exit is usually larger than the wound of entrance, unless on the way through the body the projectile is intercepted by some bones and, there is some deformity or disintegration in the projectile. Shri K. Kumar in his book "*Forensic Ballistics in Criminal Justice*" based on his experience as Directors of Ballistics Laboratory of various states, making a scientific exposition of gunshot wounds, compares wound of entrance and wound of exit as under:
Wound of Entrance

1. **Size:** Appears smaller than the wound of exit due to inversion. Greater the distance, smaller the appearance. Contact shots are an exception to this phenomena due to stretching of surface skin.
2. **Shape:** Regular, *i.e.* circular when the bullet hits at right angles and oval when it hits and penetrates in an angular direction.
3. **Nature:** Punctured and lacerated.
4. **Margins:** Usually inverted, but in case of a wound on fatty part of the body, the entrance wound may appear as everted due to protusion of fat. May be surrounded with abraded collar and contused. A quantity of grease may be deposited. There may be blackening, scorching, tattooing, singeing, of hair in case of close range shot. Microscopical examination of skin and subcutaneous tissues around the wound of entrance will disclose evidence of carbonisation, swelling and homogenisation of dermal collagen apart from the deposit of dark particles.

These opinions in the eminent books on Medical jurisprudence cannot be ignored because of the opinion of the Doctor in this case, given without reason and without the support of authority. Even if the Doctor was produced by the prosecution itself, the court is bound to see whether there is real conflict between the medical evidence and other evidence from the fact observed by the doctor. Thus, after having observed the size of the wounds and inverted and everted nature of the margins, the Doctor was required to give the opinion why he considers the gluteal wound as of entry. He has not done so. The opinion is contrary to the opinion of renowned experts. Similarly on what basis the death summary relates the gluteal wound as entry wound is not known.

8.20.2 Ballistic Evidence not Indispensable[21]

Author's Summary

It is a case of murder by gunshot fire. IO did not send the firearms to the Ballistics expert because he found them defective. The defence argued that the creditworthiness of the case is totally demolished entitling the respondents the benefit of acquittal. The SC did not accept the argument because there was ample other evidence to support the case. Firearm evidence could be dispensed with.

Highlight italicised

21. *State of Punjab v Jugraj Singh*, AIR 2002 SC 1083 : 2002 AIR SCW 823 : 2002 Cr LJ 1503 (SC).

Relevant Extract (Verbatim)

To justify the opinion of the High Court, learned counsel for the respondents-accused argued that as the doctor had not made a mention of gunshot injuries in the post-mortem report, his later deposition before the police regarding the nature of the injuries should not be accepted. We cannot accept such a plea either legally or factually. There is no obligation on the doctor to describe the origin or cause of the injuries in the post-mortem report as he stated in his deposition in the Court. Otherwise also we find that a mention of firearm injury is factually made in one of the columns of the post-mortem report. It is further contended that as the doctor had stated that "due to putrefaction the normal anatomy of tissues is disturbed, so collar of abrasion showing two zones of inner grease and outer of abrasions was not possible for me to distinguish", the medical report could not be relied upon. In support of his contention, the learned counsel has referred to Modi's *Medical Jurisprudence and Toxicology,* 22nd Edn., where it is stated that putrefaction follows the disappearance of the *rigor mortis*, and that as the *rigor mortis* was present, putrefaction could not have been noticed by the doctor. We have perused the opinion of the learned Author and find that in the same heading "Putrefaction of Decomposition and Autolysis" it is stated that "putrefaction follows the disappearance of the *rigor mortis*, but this is not always the case; since, in Northern India, especially during the hot months from April to October, it commences before *rigor mortis* has completely passed off from the lower extremities." It is not disputed that the occurrence had taken place in Northern India during the period, referred to by the learned Author.

Pointing out to another defect of not sending the weapon of offence, the guns, to the Ballistic Expert for examination for his expert opinion, it is argued that the creditworthiness of the case is totally demolished entitling the respondents the benefit of acquittal. In support of his contention, the learned counsel relied upon a judgment of this court in *Sukhwant Singh v State of Punjab*, 1995 (3) SCC 367 wherein it is held that:

> *There is yet another infirmity in this case. We find that whereas an empty had been recovered by P.W. 6, ASI Raghubir Singh from the spot and a pistol along with some cartridges were seized from the possession of the appellant at the time of his arrest, yet the prosecution, for reasons best known to it, did not send the recovered empty and seized pistol to the Ballistic Expert for examination and expert opinion. A comparison could have provided link evidence between the crime and the accused. This again is an omission on the part of the prosecution for which no explanation has been furnished either in the trial court or before us. It hardly needs to be emphasised that in cases where injuries are caused by fire-arms, the opinion of the Ballistic Expert is of considerable importance where both the firearm and the crime cartridge are recovered during the investigation to connect an accused with the crime. Failure to produce the expert opinion before the trial court in such cases affects the creditworthiness of the prosecution case to a great extent.*

In that case the evidence of the two eye-witnesses was held inadmissible as they were not examined in terms of section 138 of the Evidence Act and the court did not rely upon the sole testimony of Gurmej Singh (P.W. 3). In that context the court observed that failure to produce the expert opinion affected the creditworthiness of the prosecution case to a great extent. Nowhere it was held that on account of failure to produce the expert opinion the prosecution version in all cases should be disbelieved.

In the instant case the Investigating Officer has categorically stated that guns seized were not in a working condition and he, in his discretion, found that no purpose would be served for sending the same to the Ballistic Expert for his opinion. No further question was put to the Investigating Officer in cross-examination to find out whether despite the guns being defective the fire print was in order or not. In the presence of convincing evidence of two eye-witnesses and other attending circumstances we do not find that the non-examination of the expert in this case has, in any away, affected the creditworthiness of the version put forth by the eye-witnesses.

8.20.3 Differentiation of Marks on 2 CCs (No Gun Work)[22]

Author's Summary

It is a case of murder in which a bar tender was shot dead. The alleged culprit (finally convicted) allegedly fired one shot. The police recovered 2 fired shells from the scene. Firearm(s) was not recovered. The experts failed to interlink/delink the 2 shells. Defence urged that the second shot, fired by another unknown person, might have killed the victim.

The court was misled to believe that firearms are needed to link/delink the fired shells *inter se*.

Normally two fired cartridges can be identified whether they had been fired from the same or different firearms as the marks left by a particular firearm are unique and individual to that firearm. The firearms are not needed to ascertain the factum. The modern NIBIN (Automatic Comparison Systems) does not require firearm(s) for the identification at all. Previously fired cartridge data is used for comparison/evaluation. There is ample support for the proposition in literature: *See*: Sharma, BR. *Firearms in Criminal Investigation and Trials,* V Ed., (2017) Pages 252, 263. Only in rare cases differentiation is not possible when the marks of the firearm are not printed properly, or they are mutilated.

Highlights italicised

Relevant Extracts (Verbatim)

(1) These statutory appeals are filed under section 2(a) of the Supreme Court (Enlargement of Criminal Appellate Jurisdiction) Act, 1970 and under section 379 of the Criminal Procedure Code against the final judgment and order dated 18/20 December 2006 passed by the High Court of Delhi in Criminal Appeal No. 193 of 2006 whereby the High Court reversed the order of acquittal dated 21 February 2006 passed by the Additional Sessions Judge, Delhi, in Sessions Case No. 105 of 2001 and convicted Sidhartha Vashisht @ Manu Sharma (appellant in Crl. A. No. 179 of 2007) under sections 302, 201/120B IPC and section 27 of the Arms Act and sentenced him to undergo imprisonment for life for the offence under section 302 IPC together with a fine of Rs 50,000 to be paid to the family of the victim and in default of payment of fine, to undergo further imprisonment for three years and also sentenced him to undergo imprisonment for four years for the offence under section 27 of the Arms Act with a fine of Rs 2000 and in default to further undergo imprisonment for three months. He was further sentenced to undergo imprisonment for four years for the offence under sections 201/120B IPC together with a fine of Rs 2,000 and, in default, to further undergo imprisonment for three months. The High Court also sentenced Amardeep Singh Gill @ Tony Gill (appellant in Crl. A. No. 157/2007) and Vikas Yadav (appellant in Crl. A. No. 224/2007) to undergo rigorous imprisonment for four years and a fine of Rs 2000 each and, in default of payment of fine, to further undergo imprisonment for three months under sections 201/120B IPC.

(2) The case of the prosecution:

(a) On the night intervening 29/30 April 1999, a 'Thursday Party' was going on at Qutub Colonnade at "Once upon a time" restaurant also called "Tamarind Cafe". The liquor was being served by the bar-tenders, namely, Jessica Lal (since deceased) and one Shyan Munshi (PW-2). At about 2.00 am, Sidhartha Vashisht @ Manu Sharma (appellant in Crl. A. No. 179 of 2007) along with his friends came there

22. *Manu Sharma v State (NCT of Delhi),* AIR 2010 SC 2352 : (2010) 6 SCC 1.

and asked for two drinks. The waiter did not serve him liquor as the party was over. Jessica Lal and Malini Ramani (PW-6), who were also present there, tried to make him understand that the party was over and there was no liquor available with them. On refusal to serve liquor, the appellant took out a pistol and fired one shot at the roof and another at Jessica Lal which hit near her left eye as a result of which she fell down. Beena Ramani (PW-20), who was present there, stopped the appellant and questioned him as to why he had shot Jessica Lal and demanded the weapon from him but he did not hand over the pistol and fled away. Jessica Lal was rushed to Ashlok Hospital from where she was shifted to Apollo Hospital. On 30 April 1999, in the early morning hours, Jessica Lal was declared brought dead at Apollo Hospital.

(b) On the night intervening 29/30 April 1999 at 2.20 am, DD Entry No. 41A (Ex. PW-13/A) was recorded at Police Station Mehrauli which disclosed a shooting incident at H-five-sixth Qutub Colonnade. A copy of the said DD entry was handed over to SI Sharad Kumar (PW-78) who along with Ct. Meenu Mathew left for the spot. Near about the same time, copy of the said DD entry was also given to SI Sunil Kumar (PW-100) who along with Ct. Subhash also left for the spot. On reaching the spot, PW-78 found that the injured had been removed to Ashlok Hospital and the floor of the Restaurant was found to be wet. SI Sunil Kumar (PW-100) then left SI Sharad Kumar (PW-78) at the spot to guard the same and proceeded to Ashlok Hospital along with Ct. Subhash. The SHO, Police Station Mehrauli, Inspector S.K. Sharma (PW-101) along with his team also left the Police Station *vide* DD Entry No. 43A and reached the spot and deputed one Home Guard Shravan Kumar (PW 30) at the entrance of 'Qutub Colonnade' to guard the vehicles. On reaching Ashlok Hospital, PW-100 met Beena Ramani (PW-20), who is the owner of the Restaurant, and enquired about the incident but she asked him to talk to Shyan Munshi (PW-2) saying that he was inside and he knew everything. PW-100 then recorded the statement of PW-2 and made an endorsement on the same for the registration of the case under section 307 IPC and handed over it to Ct. Subhash to be carried to the police station, Mehrauli. At about 4.00 am, FIR No. 287/99 was registered at the police station, Mehrauli. In the meantime, Jessica Lal had been shifted to Apollo Hospital. When SI Sunil Kumar came back to the spot along with PW-2, PW 30 informed them about the lifting of one black Tata Safari from the spot. On inspection of the site, two empty cartridges were seized and, in the meantime, a supplementary statement of PW-2 was also recorded by PW-100. At about 5.45 am, PW-100 received an information by Ct. Satyavan intimating him about the death of Jessica Lal at Apollo Hospital. Charge under section 302 IPC/201/120B IPC and under section 27 of the Arms Act has been framed against the accused Sidhartha Vashisht @ Manu Sharma, charge under sections 201/120B IPC has been framed against accused Vikas Yadav, Amardeep Singh Gill @ Tony Gill and Alok Khanna, charge under section 212 IPC has been framed against Harvinder Chopra, Raja Chopra, Vikas Gill @ Ruby Gill and Yograj Singh and charge under sections 201/212 IPC against Shyam Sunder Sharma. At about 7.00 am. PW 100 recorded the statement of the Manager (PW-47), Waiter (PW-46) and Beena Ramani (PW-20)-the owner of the Restaurant.

(c) The post-mortem was conducted at about 11.30 am at the All India Institute of Medical Sciences on the same day *i.e.* 30 April 1999. In the meantime, at about 11.00 am, SI Pankaj Malik (PW-85) had been sent to Chandigarh to secure the black Tata Safari and to arrest the appellant. PW-100 corded the statements of the witnesses. On 30 April 1999 at about 4.15 pm, an FIR was registered against Malini

Ramani (PW-6), Beena Ramani (PW-20) and George Mailhot (PW-24) under sections 61/68/1/14 of the Punjab Excise Act. At about 8.30 pm, PW-100 handed over the investigation to SHO S.K. Sharma (PW-101). On the night intervening 30 April 1999/1 May 1999, at about 2 am, the police raided the farm house of the appellant and on search being conducted seized a photograph of the appellant. On 2 May 1999, a list of invited guests was prepared by PW-24. On the same day, around 10.00 pm, PW-101, got an information that a black Tata Safari has been found by the U.P. Police (Sector 24, Noida Police Station) and on the next day PW-101 went to Noida Police Station and seized the said black Tata Safari. On 5 May 1999 at about 2.30 am, Amardeep Singh Gill @ Tony Gill and Alok Khanna were arrested and from their alleged disclosure statements, the involvement of Sidhartha Vashisht @ Manu Sharma was confirmed. On the same day, Inspector Raman Lamba (PW 87) who was in Chandigarh with his team intimated the lawyer of the accused-appellant that Manu Sharma is required in the case. On receipt of the information, on 6 May 1999, the appellant surrendered before PW-87 and was later arrested at about 2.20 pm and brought to Delhi. On 7 May 1999, the police produced the appellant before the Metropolitan Magistrate and sought police remand for effecting recovery of the alleged weapon of offence. An application for conducting Test Identification Parade (TIP) of the appellant was also moved. Thereafter, the appellant was remanded to five days police custody till 12 May 1999 and thereafter on 12 May 1999 extended till 17 May 1999 on the application of the I.O., but on 15 May 1999, the appellant's remand was preponed from 17 May 1999 to 15 May 1999. On 16 May 1999, the appellant was sent to judicial custody. On 30 May 1999, the accused-Vikas Yadav was also arrested. After the completion of investigation, the other accused persons were also arrested.

(d) On 3 August 1999, charge-sheet was filed against ten accused persons. On 23 November 2000, the Additional Sessions Judge framed charges against the appellant/Manu Sharma under sections 302, 201 read with section 120B IPC and section 27 of the Arms Act, accused Amardeep Singh Gill was charged under section 120 read with section 201 IPC, accused Vikas Yadav was charged under section 120 read with section 201 IPC as also section 201 read with 34 IPC, accused Harvinder Chopra, Vikas Gill, Yograj Singh and Raja Chopra under section 212 IPC and accused Alok Khanna, Shyam Sunder Sharma and Amit Jhingan were discharged of all the offences. In 2000/2001, Revision Petition No. 596 of 2000 was preferred by the prosecution before the High Court of Delhi praying for the framing of charge against the accused persons and setting aside the discharge of Alok Khanna, Shyam Sunder Sharma and Amit Jhingan. Revision Petitions were also preferred by the accused persons against the framing of the charges against them. The High Court disposed of all the revision petitions filed by the accused persons by a common order dated 13 March 2001. On 12 April 2001, charges as per the orders of the High Court were framed and some of the charges as framed earlier were maintained. Charges under sections 120B/201 IPC were framed against accused Vikas Yadav, Amardeep Singh Gill @ Tony Gill and Alok Khanna and charges under sections 201 and 212 IPC were framed against accused Shyam Sunder Sharma. Against the rest of the accused, the charges as framed on 23 November 2000 by the trial court were maintained. The trial began in May, 2001 against nine accused. In all, 101 witnesses were examined by the prosecution and two court witnesses were also examined.

(e) … On 28 January 2002, the appellant was released on interim bail for a period of six weeks by the order of the High Court dated 25 January 2002 with a direction to surrender after the expiry of the same. In compliance with the conditions

of interim bail, the appellant surrendered on 11 March 2002 but again sought for and granted interim bail for a period of ten weeks starting from 20 March 2002. During the period from March 2002 to February 2006, the appellant was enlarged on bail on different occasions by various orders of the High Court. On one occasion, against the dismissal of the bail application by the High Court on 11 November 2003, the appellant filed a special leave petition before this Court which was dismissed by this Court on 2 December 2003. On 21 February 2006, after trial, the Additional Sessions Judge acquitted all the nine accused including the appellant-Manu Sharma.

(f) Challenging the acquittal, the prosecution filed an appeal before the High Court, being Crl. Appeal No. 193 of 2006. On 20 December 2006, the High Court *vide* the impugned order, convicted and sentenced the appellants, as mentioned in paragraphs above. Challenging the said order of the High Court, all the three appellants filed above mentioned separate appeals before this Court. All the appeals were heard together and are being disposed of by this common judgment.

(64) The evidence in respect of two FSL reports is as under:

By letter dated 6 July 1999, the seized material was forwarded to CFSL for examination and expert opinion and, *inter alia*, the following queries were made to be opined by the CFSL:

5. Please examine and opine whether the two empties present in parcel mentioned at SI. No. 5 have been fired from the same weapon?

6. Please examine and opine whether the bullet lead in parcel No. 6 and the bullet empties in parcel No. 5 have been fired from a standard firearm or a country made firearm?

7. Please examine and opine whether ejector, trigger, chamber, magazine or other chamber marks are present on the live bullet empties contained in parcel Nos. 6 & 5 respectively

8. If the answer to query No. 7 is yes them whether these marks are similar and caused by the same firearm?

The Ballistics Division of CFSL gave report in respect of the queries as under:

(1) The .22 badly mutilated lead bullet (marked BC/1) of No. 3 could have been fired from a standard .22 caliber firearm.

(2) The two .22 cartridge cases marked C/l and C/2 have been fired from two different .22 caliber standard firearms.

(3) The .22 cartridge (marked C/3) of parcel No. 5 is a live cartridge and no characteristic tool marks (*i.e.* firing pin, ejector, extractor, breech face, magazine or chamber marks) could be observed on this cartridge.

(4) The two .22 cartridge cases (marked C/l & C/2) of parcel No. 4 and the .22 cartridge (marked C/3) of parcel No. 5 have similar Head Stamp of 'C' indicating that they are of the same make. No opinion on their series (lot/batch) could however be given.

According to the State the same also contained inconclusive opinion. It was pointed out that the State has neither relied on the report of the expert Sh. Rup Singh nor had filed it in the trial Court. An application was moved by the accused for the supply of the document and *vide* order dated 14 January 2000, the Metropolitan Magistrate directed that the State will have to supply all the deficient copies and also the remaining CFSL reports sent by CFSL to SHO. The opinion of Sh. Rup Singh, Ballistic expert finally exhibited as Ex. PW 89/DB only says that "it appears that the two cartridge cases are from two different pistols." As rightly pointed out such a vague opinion of the expert can neither be relied upon nor can be any basis to come to a conclusion that there were two persons who had fired two different shots.

(65) With regard to Prem Sagar Manocha PW-95, Ballistic expert at FSL, Jaipur, a specific query being query No. 3 that whether both the empty cartridge cases have been fired from the same firearm or otherwise. In the reply to the said query, the expert opined that no definite opinion could be given on the two .22 bore cartridge cases C-l and C-2 in order to link with the firearm unless the suspected firearm is available to examination.

It was pointed out that the trial court puts a question to the witness and while putting the question first gives a specific fact finding that for reply to Query No. 3, the presence of the firearm was not necessary. This incorrect finding of fact given by the trial court based on no expertise and had resulted in grave miscarriage of justice.

It is well-settled that while giving reports after Ballistic examination, the bullets, cartridge case and the cartridges recovered and weapon of offence recovered are carefully examined and test firing is done at the FSL by the said weapon of offence and then only a specific opinion is given.

(66) It is contended by the learned counsel for the appellant/Manu Sharma that the prosecution tried their level best to suppress the report of the Ballistic expert Shri Rup Singh which was not favourable to them and that the same was exhibited at the instance of the defence as Ex. PW 89/DB. It has been further argued that while the charge-sheet was filed on 3 August 1999, the police sought an expert opinion practically at the end of the investigation *i.e. vide* letter dated 16 July 1999, Ex. PW-89/DA. At Sl. No. 67 of the charge sheet one finds mention of the letters sent by the SHO seeking the expert opinion. The charge sheet was filed without expert opinion. The accused on seeing Sl. No. 67, approached the committal Court and asked for the expert report. It has been argued that the I.O. had received the opinion in the first week of December, 1999 but did not file the same. On 21 December 1999, the Court directed the prosecution to file the report. The SPP objected to the same on the ground that the order required modification but the same was rejected and on 14 January 2000, the Court again directed supply of the expert report. It has been argued that since the report did not favour the prosecution, the same was withheld. It has been further argued by the defence that failure on the part of the prosecution to bring on record material which is in favour of the accused is a breach of Article 21 of the Constitution. It has been argued by the defence that it was improper on the part of the prosecution to condemn a ballistic expert, *i.e.,* Rup Singh without calling him in for cross-examination. It has been further argued by the defence that by virtue of section 293 Cr PC, the report is admissible in evidence and that the weapon is not required to show whether the two empties are fired from the same gun and the weapon is only required when one has to determine as to whether a particular weapon was responsible for firing the empties in question. The expert evidence is only good if it appeals to the judicial lines; appreciation of such evidence can only be the work of the Court. Reliance has been placed on *A.E.G. Carapiet v A.Y. Derderian*, AIR 1961 Cal 359 paras 10-14 to assert that every witness must be cross-examined before being discredited. The prosecution cannot challenge the expert at the stage of appeal when his testimony went unchallenged at the stage of the trial.

(67) It has been argued that the Court must lay down in clear terms the duties of a public prosecutor *i.e.*, to tell the truth even if the same is in favour of the accused. Reliance has been placed on rule 16 of the Bar Council of India Rules which are to the said effect. Reliance is further placed on Attorney-Generals Guidelines contained in Archbold Criminal pleadings edition 2003 to say that it is obligatory on the part of the prosecution to disclose all the material. It has been argued that even after an application under section 391 Cr PC has been filed, the prosecution still chose not to call the expert Rup Singh and cross-examine him. Ex. PW-89/DB supports PW-2 and *vice versa*, since his evidence is corroborated by the expert report. Attention of the Court was invited to the results of the examination. As regards the 2nd opinion given by PW-95, it has been argued that this court must assume that the prosecution sought a favourable

opinion from the said witness. The said witness obliged them and created confusion by saying that no conclusive opinion can be given without examining the weapon in question.

(67) It was pointed out by the State that the said report of Rup Singh is inadmissible in law since it is a photocopy and, therefore, does not fall within the purview of a report in terms of section 293 of the Code. In other words, in terms of the relevant provisions of the Indian Evidence Act unless the original document is placed for the scrutiny of the Court, no reliance can be placed on the photocopy without leading proper secondary evidence in this regard. In any case, both section 293 and section 294 of the Code which dispense with formal proof of documents under certain circumstances make it abundantly clear that the documents sought to be relied upon must be the originals.

1. Assuming for the sake of the argument, though not admitting, that the said report of Rup Singh, *i.e.,* Ex. PW-89/DB is admissible even though a photocopy has been placed on record and even though nowhere it has come in evidence that the same *i.e.,* the photocopy has been compared and scrutinized with the original by the Court and then placed on record, the same still loses all credence in the light of the fact that a perusal of the forwarding letter and report would show that there seems to have been some tampering with the said documents since the sequence of numbering of the parcels as between the forwarding letter and the report has been changed by somebody which fact remains unexplained as, therefore, casts a further doubt on the genuineness of the said report. The report itself with regard to the query No. 3 shows that "it appears that the two cartridge cases C-l and C-2 have been fired by two different weapons". This opinion of the expert was vague and on the basis of said opinion no credence can be lent to the fact adverted to by the defence that there were two persons who fired two different shots from two different weapons.

   Moreover the said report is oddly silent on query No. 7 of the forwarding letter wherein it was specifically asked about the various markings on the live cartridge and the bullet empties. The stand of the defence that to opine the two cartridge cases are from the same weapon or not, the pistol is not required and the pistol is only required when the opinion is sought whether they are from that particular weapon or not, cannot be accepted. It is well-settled that when pressure is built inside the cartridge case, which results in the pushing out of the bullet from the barrel, there is difference in the marks to the extent that it may be either clear or unclear and flattened or deepened thus no opinion can be rendered on account of this dissimilarity in the absence of the weapon of offence and test firing.

Further once the report of Rup Singh is rendered inadmissible the two-gun theory of the defence becomes wholly inadmissible and what remains is that the two empties found at the spot are .22 bore cartridges, that the live bullet found in the Tata Safari is a .22 cartridge and that the gun belonging to the appellant is a .22 bore pistol which was used for the commission of the crime of murder of Jessica Lal.

(68) The prosecution obtained another opinion from FSL Rajasthan and the queries made are as under:

"1. Please examine and opine the bore of the two empty cartridges present in the sealed parcel.

2. Please opine whether these two empty cartridges have been fired from a pistol or a revolver.

3. Whether both the empty cartridges have been fired from the same firearm or otherwise."

In response to these queries, the expert opinion of the FSL, Rajasthan is as under:

1. The caliber of two cartridge cases (C/l and C/2) is .24.
2. These two cartridge cases (C/1 and C/2) appear to have been fired from a pistol.
3. No definite opinion could be given on two .22 cartridge cases (C/1 and C/2) in order to link with firearm unless the suspected firearm is available for examination.

It was pointed out by the State that this opinion also was inconclusive in nature. In the worksheet, it was categorically recorded that the Investigating Officer be informed to make available the suspected firearm used for definite opinion on linking of C-1 and C-2 with the same firearm or otherwise. The worksheet also records that the firearm involved be sent for definite opinion. At this juncture, it is relevant to note that the trial court posed a leading question as under:

> **Q**. From reply to query No. 3 the presence of the firearm was not necessary. The question was whether the two empty cartridges have been fired from one instrument or from different instruments?
>
> **Ans.** The question is now clear to me. I can answer the query here and now these two cartridge cases were examined physically and under sterio and comparison microscope to study and observe and compare the evidence and the characteristics marks present on them which have been printed during firing. After comparison, I am of the opinion that these two cartridge cases C/1 and C/2 appeared to have been fired from two different firearms.

The said witness in further cross-examination replied as under:

> There is nothing in the record of the Court on my report on the basis of which I had given this finding that C/1 and C/2 were fired from two different firearms

The said witness in further cross-examination deposes that no photographs were taken or there is any other evidence to show the basis of opinion given by the witness before the trial court.

(69) The learned senior counsel for the appellant-accused has contended that the contention of the prosecution that the trial court could not have asked the particular Court question to PW-95 is contrary to section 165 Cr PC inasmuch as the power of Judge is very wide. It has been further argued by the defence that the duties of a Presiding Officer are set out in section 165 of the Indian Evidence Act. Reliance is sought to be placed on *Ram Chander v State of Haryana*, AIR 1981 SC 1036 : 1981 Cr LJ 609 : (1981) 3 SCC 191. It has been argued that the judge knew that the issue was whether two empties were fired from the same gun. It has been further argued that the judge has seen Ex. PW-89/DB and, therefore, any judge would have noticed that the controversy was whether these two bullets were fired from the same weapon or not. The judge also found out that this query went to the CFSL and CFSL answered the same. It has been argued that, therefore, the Judge knew that to answer this query weapon was not required. It has been argued that the Court must read in between the lines.

(70) It is pointed out by the State that the contention of the prosecution was that the trial court could not have first put a specific finding of its own opinion to the expert witness and then to ask him questions. Learned Solicitor-General pointed out that in the attempt of the trial court to extract the truth from the said witness, it misdirected itself in law by posing such a question. This is impermissible even as per the judgment in *Ram Chander* (supra) relied on by the defence. This judgment is in fact in favour of the prosecution since the same clearly puts an embargo on the power of a judge to ask questions so as to frighten, coerce, confuse or intimidate the witness. The danger inherent in a judge adopting a much too stern an attitude towards witness has been duly explained in the said decision. The judge cannot ask questions which may confuse a witness. The argument that the judge knew that the issue in question

was whether the two empties found on the spot were fired from the same gun is wrong and misleading. The judge knew that as per the charge framed against Manu Sharma it was he alone who was charged with the possession and use of a gun. The judge also knew that the first expert opinion was brought on record at the instance of the accused; the judge further knew that PW-95 had stated in no uncertain terms that no opinion can be given as regards the two empties without receipt of the weapon of offence.

In spite of knowing all this, the judge first put a finding of its own to the witness that he did not need the firearm in question in order to reply as to whether the two empties were fired from the same gun* i.e., *a gun and not the gun. The Court exceeded its power under section 165 of the Evidence Act by putting the question after giving its own finding.

(71) On behalf of the prosecution, it is pointed out that the entire argument of the accused that an expert opinion was sought at the fag end of the charge sheet to seek a favourable opinion in favour of the prosecution in fact suggests that the I.O. in question was oblivious of the fact that such an opinion could work to the detriment of the case of the prosecution *i.e.,* two empties having been fired from the same weapon of offence belonging to accused Manu Sharma. The fact that the I.O. sought to mention at S. No. 67 of the list of documents in the charge-sheet about the forwarding letter to the expert only suggests that the prosecution had no intention of carrying out the act of seeking an expert opinion, is hiding.

The discretion on the part of the I.O. and the superior officers was rightly exercised when they decided not to file the expert report since they realized that the expert report is ambiguous as it uses the term "appear" when it suggests that the two empties appear to have been fired from different weapons. Clearly the said opinion was far from conclusive and would have only created confusion in the case of the prosecution.

Thereafter a second opinion was sought wherein the expert *i.e.*, PW-95 opined that a conclusive opinion can only be given after the receipt of the weapon of offence. The argument that the weapon of offence is not required to determine whether the two bullets have been fired from the same gun is based on the wrong premise that the two empties would necessarily consist of features which would enable an expert in determining the said fact. For instance, as in the case of a handwriting expert who has to give an opinion about two different sets of near identical questioned documents and as to whether the same belong to different persons, if the argument of the accused has to be accepted then the expert should be able to give such an opinion without having in his possession the specimen handwriting and the admitted handwriting of the accused. It is stated that such an approach would render the opinion as that of a layman and not an expert. Similar would be the case of a finger print expert who undertakes the process of discovering two different sets of finger print which are in question, without having the specimen or the admitted finger print of the accused in question. In other words,

> ***an expert is only an expert if he follows the well accepted guidelines to arrive at a conclusion and supports the same with logical reasoning which is a requirement of law as laid down in the Indian Evidence Act. In the present case, the moment Rup Singh uses the word "appear" his opinion unsupported by reasons becomes inconclusive and stands discredited for the purpose of placing reliance on. The opinion of Rup Singh was at query No. 7 as to "please examine and opine whether ejector, trigger, chamber, magazine or other tool marks are present on the live bullet and the bullet empties contained in parcel Nos. 6 & 5 respectively."***
>
> ***Though Shri Rup Singh has given opinion qua query No. 5 that the two .22 cartridge cases appear to have been fired from two different .22 caliber standard firearms but his opinion is completely silent on the marks i.e. ejector, trigger, chamber, magazine or other tool marks on the bullet empties (Ex. PW 89/DB). Clearly an option was available to the accused under section 293 Cr PC to call for the witness and ascertain from his for sure that the two empties were in fact fire from two different weapons,***

however, the accused did not choose to do so in terms of section 293 Cr PC In any case, the opinion of Rup Singh as of today is of little use to the accused for the reasons stated above and since it is both inconclusive and unsupported by any reasoning whatsoever and, therefore, cannot appeal to the judicial mind of this Court. Similar is the case with the expert opinion of PW-95 which is again inconclusive. There is no evidence on record to suggest that PW-95 gave an opinion to oblige the prosecution. On the contrary, his response to the Court question reveals that he was extremely confused as to the issue which had to be addressed by him in the capacity of an expert. In the concluding part of his testimony he reaffirms the opinion given by him which is that without test firing the empties from the weapon of offence no conclusive opinion can be given.

72. It is pertinent to note that the testimony of the experts i.e., Rup Singh exhibited as Ex. PW-89/DB and PW-95 Prem Sagar Minocha exhibited as Ex. PW-95/C-1 in inconclusive. The expert PW-95 Prem Sagar Minocha has stated in his report that it is only on receiving the weapon of offence that a conclusive opinion as to whether the two empties (cartridge cases) found at the spot were fired from the same weapon or from two different weapons could be given.

73. The defence seeks to reply upon the testimony of PW-2 with regard to the two-gun theory put forward. In this regard, the defence seeks to corroborate the said part of PW-2's testimony with the testimony of the two ballistic experts. It has also been contended by the defence that the testimony of a hostile witness must be corroborated by the other reliable evidence on record in order to be admissible. The law is very clear that where a witness for the prosecution turns hostile, the Court may rely upon so much of the testimony, which supports the case of the prosecution and is corroborated by other evidence. PW-2's testimony as regards the identity of the person shooting, is certainly not corroborated by the testimony of the experts since both the experts have given opinions which cannot qualify as the conclusive opinion of experts.

8.20.4 One or Two Guns from Injuries on Two Persons[23]

Author's Summary

It is a case of gunshot fire(s) which killed one and injured another. There were 3 types of evidence. The eyewitnesses saw one gunshot fire. Medico-legal expert found that the deceased was killed by a bullet injury and the injured had pellet injuries. The ballistics expert opined that 2 firearms have been used. The trial court acquitted the accused because of contradictory evidence. High Court reversed the order.

The Sc on re-appreciation of the evidence agreed with the trial court and issued guidelines to the appellate courts when to reverse trial court decisions.

Highlights italicised

Relevant Extracts (Verbatim)

7. On 14 March 1979, the deceased, Shiv Charan PW-1, Brij Raj Singh PW-2, Yad Ram PW-4, Nathi Lal (not examined) and Bishambhar (not examined) had taken the customary Gur (Jaggery) during the Holi festival.

8. On their way home, they happened to pass by the home of the accused. The accused was standing just outside his home and was holding a shot gun. The accused began to verbally abuse the deceased. Thereafter, the accused fired one single shot from his gun,

23. *Ghurey Lal v State of Uttar Pradesh,* AIR 2009 SC (Supp) 1318 : 2008 AIR SCW 6598 : (2008) 10 SCC 450.

killing the deceased with a bullet and causing injuries to Brij Raj Singh PW-2 with pellets. Hearing the gun shot, some people quickly assembled at the scene. The accused fled to his room, which he locked from inside. The uncle of the deceased, Shiv Charan, lodged the FIR that very evening, the 14 March 1979 at 6.15 pm, at the Barhan Police Station in the District of Agra.

9. The accused provided his own version of the event. According to the statement of the accused under section 313 of the Code of Criminal Procedure, he went to the place of Kanchan Singh where Gur (Jaggery) was being distributed. One Bal Mukand told the accused to leave the Gur distribution ceremony, as the deceased, Brij Raj Singh PW-2, Yad Ram PW-4, Nathi Lal and Bishambhar had collected pharsa, lathis and kattas declaring that they will deal with him (accused) when he comes there. On hearing this, the accused returned to his home and grabbed his gun. The deceased and others then arrived at his home, brandishing weapons. The deceased carried a *pharsa*, Nathi Lal had a *katta*, Brij Raj Singh a knife and Yad Ram and Bishambhar possessed lathis. To threaten and check them, the accused aimed his gun at them. This was to no avail. The deceased and others struck at the accused, hitting his gun. Nathi Lal fired his katta, causing pellet injuries to Brij Raj Singh PW-2. A scuffle ensued in which the deceased's group tried to snatch away his gun. In the scuffle, the gun was accidentally fired, killing the deceased. The accused sustained pharsa and lathi blows on the butt and barrel of the gun. Fearing for his life, the accused went to his room and locked the door from inside.

10. Brij Raj Singh PW-2 was sent to the Government Hospital, Barhan for medical examination. Dr. Govind Prasad PW-3 found the following injuries on the person of Brij Raj Singh, PW-2:

1. Round lacerated wound 0.3 cm x 0.3 cm on right side back 10 cms away from mid line 9 cms below the border of scapula. Margins burnt and inverted, and tattooing present in an area of 5 cms. No pellets palpable. Bleeding present.
2. Lacerated wound of exit 1.5 cm x 0.5 cm on right side back 0.8 cm away and lateral from injury No. 1. Skin burnt and tattooing present in the area of 5 cm x 5 cms. Merging of the wound inverted. No pellets palpable.

11. The Doctor opined that the injuries were caused by a firearm. He advised that x-rays be taken and that the injuries be kept in observation. In his opinion, the injuries were caused by a gunshot and were of fresh duration. In his opinion, the injuries could have been caused around 4 pm. The doctor sent the memo Ex. Ka-4 on the same day, informing the case of Medico-legal nature to the Barhan Police Station.

12. The autopsy on the deceased was conducted by Dr. Ram Kumar Gupta, PW-5, Medico-legal expert, SNM Hospital, Firozabad, District Agra. It revealed the following ante-mortem injuries on the deceased:

1. Gunshot wound of entry 2.5 cm x 2.5 cm x through and through on right side neck 2 cm lateral to midline of neck front aspect.
2. Gunshot wound of exit 5 cm x 4 cm x through and through on right side back of neck 5 cm below right ear corresponding to injury No. 1 with margins everted.

The Doctor opined that the cause of death was due to shock and haemorrhage as a result of ante-mortem injury.

15. *The crucial question which arose for consideration was whether the injuries caused to Brij Raj Singh PW-2 could have been caused by the same shot that killed the deceased. If that was possible, the prosecution version became probable. But if the shot that killed the deceased and the shot that caused injuries to Brij Raj Singh were from different weapons, then the defence version was more probable. Shri B. Rai, Ballistic Expert, Forensic Science Laboratory, U.P.*

was called as court witness No. 1. He was asked to explain the nature of the 12 bore cartridges and give an opinion, for which he wanted time to carry out experiments in the laboratory. The gun was given to him and he performed a test in his laboratory in the light of the statements of the eye-witnesses, medical report and site-plan. He submitted his report, Ex. C-Ka. l, wherein he clearly opined that injuries Nos. 1 and 2 of the deceased were possible by the gun Ex. 3 of the accused and injuries Nos. l and 2 of the injured Brij Raj Singh were possible by another fire. By "fire", it is clear from the record that the Ballistic Expert was referring to a "firearm".

16. Ultimately, we must answer the following question: Whether the prosecution story of a single shot causing injury to two persons, that is bullet injury to deceased and pellet injury to Brij Raj Singh, with the accused as the aggressor, stands sufficiently proved beyond reasonable doubt?

17. In order to decide whether a single shot was fired or in fact two different shots were fired, we must carefully examine the versions of the prosecution and the defence and the report of the Ballistic Expert. According to the trial court, the medical evidence coupled with the Ballistic Expert report revealed the existence of two fires from two weapons and as such was inconsistent with the prosecution story. The trial court further provided that it is difficult to separate falsehood from the truth, as some material aspects of the occurrence appeared to have been deliberately withheld. "One has to separate the chaff from the grain and it is difficult to lay hand upon what part of the prosecution evidence is true and what part is untrue". According to the accused, the trial court had taken a reasonable and possible view of the entire evidence on record.

20. The post-mortem report Ex. Ka-5, photo lash Ex. Ka-7 and the statement of Dr. Ram Kumar Gupta PW-5 indicate that the wound of entry was on the right side of the neck 2 cm. lateral middle line on front aspect. The exit wound was on the right side back of neck 5 cm. below the right ear. This means that the bullet had entered from the front side of the neck from *(at?)* a distance of 2 cm. lateral to middle line, and it had come out from the back of the neck at a place 5 cm. below the right ear. In this way, the trial court reasoned that the barrel of the gun, when discharging, was slanting vertical. The mouth of the barrel was upward and its butt downward. The barrel and the butt were not horizontal to the ground at that time.

The trial court observed that injury No. 1 (wound of entry) on Brij Raj Singh PW-2 was on the right side of his back 10 cm. away from the mid line, 9 cms. below the lower border of scapula. Injury No. 2 (wound of exit) was on the right side of his back 8 cm. away and lateral from injury No. 1. This means that the exit wound was by the side of the entry wound at a distance of 8 cm.

21. The dictionary meaning of 'lateral' is "by the side" and this means that the two injuries caused by pellets to Brij Raj Singh PW-2 were horizontal and not vertical. The trial court opined that the single shot could not have caused vertical injury to one person and horizontal injury to another. It found it doubtful and not sufficiently proved that the same shot could have injured Brij Raj Singh and killed the deceased.

22. This conclusion is further fortified by the report of the Ballistic Expert Sri B. Rai Court witness No. 1. He has given a definite opinion after making actual experiments by firing shots. This was done from the distance at which the occurrence was said to have taken place. The eye-witnesses had testified to this distance. The Ballistic Expert opined that the injuries to Brij Raj Singh PW-2 were from a different shot from the one that killed the deceased.

The relevant part of the evidence of the Ballistic Expert reads as under:

> **Question**-Whether bullet and *Chharras* both be used in 12 bore gun or not?
>
> **Ans.**-12 bore gun have no bullet. It has small *chharas*, big *Chharras* or one single ball shot with diameter about 0.645".

23. The Ballistic Expert after studying the post-mortem report observed as under:

> *"Studying the post-mortem report No. 51/79 of deceased Ghurey Lal and injury report of Brijraj Singh dated 14 March 1979, statement of doctor and witnesses and site plan and keeping the result of above experiments in mind, I reached in conclusion that injury No. 1 and 2 possible to sustain to deceased Ghurey Lal by this gun from the distance of 10 feet and injury No. 1 and 2 of injured Brij Raj Singh seems to sustain by some other shot."*

24. The Ballistic Expert categorically stated that in cartridges of standard 12 bore shot guns, bullets from other rifles cannot be used with small and big *Chharras* (pellets). Therefore, the trial court concluded that both the injuries were not possible by a single firearm.

25. Leading experts of forensic science, particularly ballistic experts, do not indicate that from a single cartridge both bullets and pellets can be fired. Professor Apurba Nandy in his book "Principles of Forensic Medicine", first published in 1995 and reprinted in 2001, discussed cartridges. Professor Nandy mentioned that in some cases, instead of multiple pellets, a single shot or metallic ball, usually made of lead, is used. We note that the discussion regarding cartridges exclusively mentions pellets. No mention of bullets and pellets in cartridges is found in the numerous volumes of scholarly literature that we have consulted. Relevant discussion reads as under: p 241

The Cartridges (the ammunitions)—

The cartridge of a shotgun and the cartridge of a rifled weapon are essentially different in their Makes. The cartridge of a shotgun—(Fig. 10.69) The cartridge of a shotgun has the following parts and contents—

1. The cartridge case.—The longer anterior part of the cartridge case is made of cardboard. The posterior part and the posterior surface is made of brass. The margin of the breach end of the cartridge case is rimmed, so that, the cartridge can be properly placed inside the chamber and with pressure on the rim the empty cartridge case can be easily ejected out of the chamber. The anterior margin of the cartridge case is twisted inward to keep the pellets and other materials inside the case compact. The anterior part of the cartridge case is made of cardboard, for which, with the production of gas inside the cartridge case it can slightly expand so that, the twisted grip by the anterior margin will be released and the pellets can come out of the case. The posterior metallic part keeps the shape of the breach end of the cartridge intact. It helps to maintain the right position of the cartridge in the chamber, so that, the percussion pin of the hammer strikes the percussion cap rightly at the breach surface of the cartridge. At the central part at the breach end inside the cartridge case is the percussion cap.
2. The percussion cap.—It contains primer or priming mixture and there are some vents or openings on the wall of the percussion cap. When the posterior surface of the percussion cap is struck by the percussion pin, the priming mixture which consists of a mixture either of mercury fulminate, pot, chlorate and antimony sulphide or of antimony sulphide with lead styphnate, lead peroxide, barium nitrate or tetracene, gets ignited due to the pressure and friction and fire comes out through the vents or openings on the wall of the percussion cap.
3. Contents inside the cartridge case.

Surrounding the percussion cap is the gun powder or the propellant charge which cannot ignite by pressure or friction and which on being ignited does not produce flame but produces huge amount of gas. Usually the gunpowder of the shotguns contains charcoal, pot, nitrate and sulphur. This combination of the gunpowder is known as black powder, as it produces much smoke. Now-a-days semi-smokeless gun powder is in use in shot guns which is a combination of 80% of black powder and 20% of smokeless powder. Smokeless powder is ordinarily used

in the cartridges of rifles (nitrocellulose or a combination of nitrocellulose and nitroglycerine). The black powder produces 200-300 ml. of gas per grain. In front of the gunpowder, inside the cartridge case, there is a thin cardboard disc. In front of the cardboard, disc is placed in the wad. The wad is made of soft substance like, felt, cork, straw or rug. In front of the wad, there is another cardboard disc. In front of this disc, the pellets are placed. The pellets are spherical projectiles used in shotguns. Their size may be variable, according to the need and make. One ounce of pellets may consist of 6 to 2,600 of them. In front of the pellets there is another cardboard disc on the anterior margin of which the anterior margin of the cartridge case is twisted. The functions of the wad are to give compactness to the gunpowder, to prevent admixture of propellant charge and the pellets and prevent leakage of the gas produced after the firing. Wad also cleans the inner surface of the barrel after the pellets pass out through the barrel. To facilitate this cleaning, some greasy material is soaked in the wad. In between the propellant charge and the wad there is a cardboard disc so that the greasy substance in the wad will not be soaked by the propellant charge and become useless. In between the wad and the pellets there is a disc which in one hand prevents impregnation of the pellets in the soft wad and on the other, prevents leakage of the greasy substance from the wad in the pellets which would otherwise become adhesive to each other losing their dispersion capacity. The anterior – most disc, placed in front of the pellets, give compactness to the pellets and the whole content of the cartridge case.

Shots of different sizes are suitable for different purposes. Accordingly "Buck shots" or "Bird shots" have different sized shots or pellets for hunting wild birds or other prey. In some cases instead of multiple pellets a single shot or metallic ball, usually made up of lead, is used. "Rifled slugs" are single shot projectiles for shot guns with prominent parallel grooves on the surface."

26. In this book, the assessment of the direction of firing from the margin of the wound of the entrance has also been given, which reads thus: p 257

> Assessment of the direction of firing from the margin of the wound of entrance—
>
> (i) (a) In case of shotgun injury, the pattern of dispersion of the pellets give the direction of the firing. The pellets disperse over a wider area as it travels more. Hence firing is suspected to have been from the side opposite to the side of wider dispersion of the pellets …

27. *"Firearms in Criminal Investigation and Trials" was written by a distinguished professor Dr. B.R. Sharma***.** He has written in some detail about 12 bore guns. This book also defines Pellet Pattern which reads thus: p 204

> **Pellet Pattern**.—The area covered (pellet spread) by the pellets fired from a shotgun is proportional to the distance between the muzzle of the firearm and the target. Greater the range, greater is the area covered by the pellets. The spread of the pellets is affected mainly by the length of the barrel of the firearm and its muzzle characteristics (whether it is choked or not). The condition of the ammunition also affects the results. If experiments are performed with the same firearm and ammunition of the same make and batch, the test patterns provide fairly accurate estimates of the range.
>
> Generally, the whole charge enters the body *en masse* up to a range of about two metres in a factory-made 12-bore shotgun. It forms a rat-hole of about two to six centimetres in diameter. The rat-hole is surrounded by individual holes when the range of fire is about two to seven metres …

28. The trial court stated that in the FIR itself it is mentioned that the injuries to Brij Raj Singh were by pellets and that of the deceased by a bullet. The Ballistic Expert has stated that the cartridge containing pellets cannot contain a bullet.

Accordingly, the trial court reasoned that two weapons were used.

29. The Ballistic Expert is a disinterested, independent witness who has technical knowledge and experience. It follows that the trial judge was fully justified in placing reliance on his report.

30. The trial court also observed that removing the body of the deceased from the place of occurrence creates doubt that the prosecution was planning to substitute another story for the real facts. As such, the possibility that the deceased and his group were the aggressors is not ruled out. It is possible that *pharsa* and *lathi* blows had made the marks that were found on the gun. The gun may have snatched all of a sudden, causing it to fire upon the deceased and Brij Raj. Under the circumstances of the case, the use of another weapon, which had caused injuries to Brij Raj Singh PW-2, is also not ruled out.

31. The trial court further observed that the substratum of the prosecution story about the injuries to Brij Raj Singh is not established beyond reasonable doubt and the story of shooting the deceased by the same shot fired by the accused is not separable from other doubtful evidence of eye-witnesses. The circumstances show that the possibility of aggression on the part of the complainant side is not ruled out, then the benefit of doubt for killing the deceased by the accused would also go to the accused.

32. The trial court also found force in the plea of right of private defence as set up by the accused. The trial court mentioned that there is force in this argument where the circumstances of the case show that two firearms were used in the occurrence. The accused was all alone in his house at that time. The availability of a second weapon is possible only when the complainant side had brought it to the scene. This circumstance supports the defence case, that the complainants' side was the aggressor and they had come armed with weapons to the scene. It follows that the accused would apprehend grievous hurt and danger to his life. Accordingly, the right of self-defence was open to him.

Main reasons for acquittal by the trial court:

38. The trial court acquitted the accused for the following reasons:

1. The prosecution story of single shot injury to two persons one standing horizontally and the other vertically stands totally discredited by the medical and the evidence of Ballistic Expert.
2. According to the FIR, the deceased received a spherical ball (ball shot) bullet injury and Brij Raj Singh PW-2 received pellet injuries. The accused's gun had a cartridge that could only contain pellets. The Ballistic Expert has clearly stated that a cartridge containing pellets cannot contain a bullet. As such, it appears that two weapons were used.
3. Dr. Ram Kumar Gupta, PW-5 who conducted the post-mortem of the deceased, clearly stated that the deceased received injuries from a bullet whereas Dr. Govind Prasad Bakara who had examined Brijraj Singh PW-2 clearly stated that both injuries were caused by a pellet. Therefore, according to medical evidence coupled with the evidence of the Ballistic Expert, two firearms must have been used.

   This version is quite inconsistent with the prosecution story.
4. The injuries received by Brij Raj Singh PW-2 were from the back side and the injury received by the deceased was from the front side and this shows that two weapons may have been used.
5. Removal of the body of the deceased from the place of occurrence also created doubt with regard to the veracity of the prosecution version.
6. The possibility that the deceased and the complainant's side were aggressors and had gone there and caused *pharsa* and *lathi* blows on the accused cannot be ruled out because

of the marks on the gun Ex. 3. That the said gun was fired in snatching all of a sudden, injuring the deceased also cannot be ruled out from the circumstances of the case.

7. The trial court did not discard the defence version of right of private defence as pleaded by the accused.
8. The trial court observed that it is difficult to separate falsehood from the truth, where some material aspects of the occurrence seem to have been deliberately withheld. It is a well-established principle of criminal jurisprudence that when two possible and plausible explanations co-exist, the explanation favourable to the accused should be adopted.

Main reasons for reversal of acquittal order:

39. The High Court gave the following reasons for setting aside the acquittal:

1. A perusal of the post-mortem report goes to show that autopsy conducted on the dead body of the deceased revealed ante-mortem gunshot wound of entry 2.5 cm x through and through on right side neck 2 cm lateral to midline of neck front aspect having corresponding wound of exit 5 cm x 4 cm on right side back of neck 5 cm below right ear. Therefore, this injury was almost horizontal.
2. Medical examination of injured Brij Raj Singh revealed a round lacerated wound of entry 0.3 cm x 0.5 cm on right side back 10 cm away from midline and 9 cm below lower border of scapula having wound of exit 1.5 cm x 0.5 cm x 0.5 on right side back 0.8 cm away and lateral from injury No. 1. Thus, this injury was also almost horizontal.
3. The observation made by the trial judge that firearm injury caused to the deceased was vertical and to that of Brij Raj Singh horizontal is wholly fallacious.
4. A layman does not understand the distinction between a cartridge containing pellets and the bullet. In common parlance, particularly in villages when a person sustains injuries by gunshot, it is said that he has received '*goli*' injury. Ghurey Lal fired at his uncle with his gun causing him *goli* (bullet) injury and Brij Raj Singh also received pellet (*chharra*) injury which goes to show that injuries received by them were caused by two different weapons. There is hardly any difference between bullet and pellet for a layman. From 12 bore gun cartridge is fired and 12 bore cartridge always contain pellets though the size of pellets may be different.
5. A perusal of the post-mortem reports goes to show that autopsy conducted on the dead body of the deceased revealed ante-mortem gunshot wound of entry 2.5 cms. through and through on right side neck 2 cm lateral to midline of neck front aspect having corresponding wound of exit 5 cm x 4 cm on right side back of neck 5 cm below the right ear. Therefore, this injury was almost horizontal.
6. The medical examination of injured Brij Raj Singh revealed a round lacerated wound of entry 0.3 cm x 0.5 cm on right side back 10 cm away from midline and 9 cm below lower border of scapula having wound of exit 1.5 cm x 0.5 cm x 0.5 cm on right side back 0.8 cm away and lateral from injury No. 1. Thus, this injury was also almost horizontal.
7. The learned trial judge had noted the evidence of B. Rai, Ballistic Expert, C.W. 1 that both the injuries would have been caused by two shots. While B. Rai, Ballistic Expert, C.W. 1 had given the said opinion, he had also stated in his cross-examination by the prosecution that if the assailant fired from place 'C' and the person receiving pellet injury standing at place 'B' would have turned around, on

dispersal of pellets he could have received the pellet injuries if deceased and injured both would have stood in the same line of firing.

Our conclusions:

40. *We disagree with the High Court. Admittedly, the deceased died of a bullet injury whereas Brij Raj Singh, PW-2 received pellet injuries. It is well- settled that a cartridge cannot contain pellet and bullet shots together. Therefore, the injuries on deceased and injured PW-2 clearly establish that two shots were fired from two different firearms.*

73. In light of the above, the High Court and other appellate courts should follow the well-settled principles crystallised by number of judgments if it is going to overrule or otherwise disturb the trial court's acquittal.

1. ***The appellate court may only overrule or otherwise disturb the trial court's acquittal if it has "very substantial and compelling reasons" for doing so. A number of instances arise in which the appellate court would have "very substantial and compelling reasons" to discard the trial court's decision. "Very substantial and compelling reasons" exist when:***
   - ***(i) The trial court's conclusion with regard to the facts is palpably wrong;***
   - ***(ii) The trial court's decision was based on an erroneous view of law;***
   - ***(iii) The trial court's judgment is likely to result in "grave miscarriage of justice";***
   - ***(iv) The entire approach of the trial court in dealing with the evidence was patently illegal;***
   - ***(v) The trial court's judgment was manifestly unjust and unreasonable;***
   - ***(vi) The trial court has ignored the evidence or misread the material evidence or has ignored material documents like dying-declarations/report of the Ballistic expert,***
   - ***(vii) This list is intended to be illustrative, not exhaustive.***
2. ***The Appellate Court must always give proper weight and consideration to the findings of the trial court.***
3. ***If two reasonable views can be reached – one that leads to acquittal, the other to conviction – the High Courts/appellate courts must rule in favour of the accused.***

78. On careful analysis of the entire evidence on record, we are of the view that the reasons given by the High Court for reversing the judgment of acquittal are unsustainable and contrary to settled principles of law. The trial court has the advantage of watching the demeanour of the witnesses who have given evidence, therefore, the appellate court should be slow to interfere with the decisions of the trial court. An acquittal by the trial court should not be interfered with unless it is totally perverse or wholly sustainable.

79. On consideration of the totality of the circumstances, the appeal filed by the appellant is allowed and the impugned judgment passed by the High Court is set aside. The appellant would be set at liberty forthwith unless required in any other case.

8.20.5 Accidental or Homicidal Firing[24]

Author's Summary

It is a case of gunshot injuries. There were 3 injuries on the victim. The medico-legal experts gave vacillating opinion on the firearm injuries. However, the SC on the basis of presence of pellets, the nature of damage, the number of shots (2) and clear evidence of the eyewitnesses showed it was a case of attempted murder. It rejected defence plea that as there was no strong motive, nor the victim shot at vital part and that therefore it was a case of accident.

Highlights italicised

Relevant Extracts (Verbatim)

2. Satyavir Singh, appellant-accused was tried for an offence under section 307 of the Indian Penal Code, 1860 (hereinafter referred to as the 'Code') and sections 25/27 Arms Act, 1959 (for short the 'Act') in the Court of Assistant Sessions Judge, Bulandshahr, and was found guilty for both the offences. After hearing the accused on the question of sentence, the Court awarded him three years R.I. under section 307 of the Code and one year R.I. under section 27 of the Act. Both the sentences were ordered to run concurrently. Upon appeal by the accused, the learned 1st Additional Sessions Judge at Bulandshahr set aside the judgment and sentence and while partly allowing the appeal by its judgment dated 6 November 1980 acquitted him of both the charges for which he was convicted by the learned Assistant Sessions Judge, Bulandshahr and only convicted him for offence under section 25(1)(a) of the Act and sentenced him to imprisonment till the rising of the Court. With the leave of the High Court, the State preferred an appeal against the judgment of acquittal. The High Court of Judicature at Allahabad *vide* its judgment dated 20 October 2008 set aside the order of acquittal and while allowing the appeal partly, it convicted the appellant under section 307 of the Code and declined to interfere with the sentence awarded by the First Appellate Court in relation to an offence under section 25 of the Act. Legality and correctness of the judgment and order of sentence passed by the High Court is questioned by the appellant-accused in the present appeal under Article 136 of the Constitution of India *inter alia* but primarily on the following grounds:

(a) The High Court has erred in law in setting aside the judgment of acquittal recorded by the First Appellate Court, which was reasoned one and based on a proper appreciation of evidence. Thus the High Court ought not to have upset the judgment of acquittal. Therefore, the High Court has acted beyond the limitations on such exercise of power and heavy reliance is placed on the case of *Ganesh Bhavan Patel v State of Maharashtra*, (1978) 4 SCC 371 : AIR 1979 SC 135 : 1979 Cr LJ 51.

(b) No motive was proved and in absence of a specific motive, the High Court has erred in holding that the appellant is guilty of offence under section 307 of the Code.

(c) The expert evidence being at variance and the medical evidence not supporting the injuries allegedly found on the person of the victim, the benefit of doubt should have been given to the accused as the prosecution had failed to prove its case beyond reasonable doubt.

24. *Satyavir Singh v State of Uttar Pradesh,* AIR 2010 SC (Supp) 651.

(d) The Court should have appreciated that it was an accidental firing and the prosecution had not put forth any explanation on record as to how the weapon (double barrel gun) was broken.

* * *

5. Facts: Bhanu Prakash Sharma, (PW-1) was taking tea at Hamid Khan's Hotel at about 2.30 pm. His brother Dharam Prakash (PW-3) arrived at the crossing towards Narora Bus Stand. Dharam Prakash aged about 18 years was a student of Khurja Polytechnic. Satyavir Singh, accused is the resident of village Niwari. Vijav Singh is his elder brother and owned a double barrel gun under a valid licence. It is the case of the prosecution that the fields of farmers in village Niwari were irrigated by tubewell of Prem Shankar Thakur. A road was constructed for the power house due to which some farmers of village Niwari started irrigating their fields from the tubewell of Bhanu Prakash Sharma (PW-1), resident of village Jairampur Bangar. This caused some displeasure to Prem Shankar Thakur, father of Satyavir Singh, the accused. At about 2.30 pm on 9 February 1975 said Bhanu Pratap Sharma was taking tea in the Hotel of Hamid Khan at Chauraha of the village. Dharam Prakash came from the side of Narora Bus Stand. The accused on seeing Dharam Prakash, who ultimately examined as PW-3, challenged him by saying that how he was irrigating the fields of villagers from his tube-well. The accused, as already noticed, was armed with a licenced gun of his brother. The accused thereupon fired two bullets from that gun on Dharam Prakash.

Dharam Prakash was medically examined on that very day by Dr. Suresh Chandra Singh (PW-5) and the following injuries were noticed:

Injuries:

(1) Lacerated wound 1 cm X 1 cm X thickness of the left upper arm, on the left upper arm front aspect in the upper part. There are four abrasions each l/4 cm X l/4 cm on its lower and outer aspect. Suspected underneath Adv. X-ray. The margins of the wound are inverted.

(2) Lacerated wound l.5 cm X l.5 cm X thickness of the left upper … on the back aspect of the left upper arm 2 cm. Above the elbow … Suspected underneath. Adv. X-ray. The margins of the wound are inverted.

(3) Lacerated wound 7.5 cm X 3.5 cm on the left forearm upper half-inner aspect. It is bone deep. Suspected fracture underneath. Adv. X-ray.'

These findings were set aside by the learned First Appellate Court which stated that it was an accidental firing and the prosecution has failed to prove its case. The benefit was given to the accused primarily on certain surmises and conjectures and doubting the presence of the witnesses particularly Ram Shankar whose presence had been admitted by the accused himself in the report lodged by him and even in his explanation before the Court.

21. *Definite doubts or lacunae in the case of the prosecution may result in benefit of doubt being given to the accused and consequential acquittal. However, such doubts and lacunae must be clearly distinguished from doubts or lacunae based upon certain assumptions. In such cases what appears to be loop-hole in the case of the prosecution at the first glance, on appropriate examination and appreciation of evidence, may fall in the other class. The following observations of the learned First Appellate Court clearly demonstrates that Court has founded its judgment of acquittal more on surmises and suspicion and the views of the Court which were not supported by evidence on record.*

Illustratively, the following observations can usefully be noticed:

(a) It is evident that left arm is not a vital part. If appellant was fired from a close range within 4 feet, he could have easily aimed at the chest of the victim, which could have killed him at the spot.

(b) But when the motive alleged is the very genesis or commencement of the prosecution story, it would not be possible to discard the defect relating to motive or genesis in the prosecution story.

(c) The third important feature of the case is the simultaneous presence of Bhanu Prakash, Dharam Prakash and Ram Shanker at the crossing.

(d) Then the only possible inference is that they were together at the crossing or at the tea stall for some other reason and as soon as they saw appellant Satyavir Singh, a young man along with a gun, they were tempted to snatch the gun.

According to medical evidence the very seat of the injuries discloses that the shots would have been fired during snatching.

* * *

20. The above observations demonstrate that the learned First Appellate Court has proceeded on the basis of certain presumptions which in the opinion of the Court could be the correct approach. But such approach may be guided by the doctrine of perversity. If findings are neither supported by evidence nor such approach could be adopted by the person of common prudence or behaviour, then the court may interfere in a judgment of acquittal. The First Appellate Court is a court of both fact and law and as such has jurisdiction to entirely re-appreciate the evidence. Thus, while setting aside the order of conviction it has to equally ensure that no injustice is done and on certain assumptions of facts, guilty may not go scot free. A person otherwise is proved to be guilty by the prosecution by leading cogent and reliable evidence, normally would not be given the benefit of doubt on the basis of certain assumptions or presumptions of facts. The Court may have to notice and rely upon behaviour of the person of a common prudence only where the direct evidence have been produced. As we shall shortly proceed to discussion *that the assumptions raised by the First Appellate Court are not supported on record. We find that the High Court has not fallen in error of law in setting aside the order of acquittal and affirming the judgment of conviction rendered by learned trial court.*

21. Now we may proceed to examine the appreciation of evidence on record by the First Appellate Court acquitting the accused as well as that of the High Court reversing the judgment of acquittal.

24. The High Court noticed that the fields of farmers in village Niwari were irrigated from the tubewell of Prahalad Singh Thakur which was installed in that village. It was because of construction of the road for the Power House that the farmers of village Niwari started irrigating from the tubewell of Bhanu Prakash Sharma resident of Village Jairampur Bangar. This was not bearable to the accused who is the son of Prahlad Singh Thakur. Thus, this may not be exactly a motive but was a reason enough for the accused to take an offensive step against the injured.

23. The first information report was lodged by Bhanu Prakash Sharma without any delay and as already noticed Dharam Prakash (PW-3) had been challenged by the accused saying that how he was irrigating the fields of the villagers of his village from his tubewell. Armed with a licensed gun of his brother, he opened fire on Dharam Prakash and shot two bullets. The occurrence was seen by Bhanu Prakash Sharma (PW-1), who was present there as well as Rama Shankar (PW-4) and some others. The accused was arrested and the gun was also deposited. Ext. Ka-1 report to the police station was lodged by Bhanu Prakash Sharma (PW-1).

Dharam Prakash was medically examined on 9 February 1975 at about 4.35 pm and according to Dr. Suresh Chandra Singh (PW-5), three injuries were found on the injured who was then subjected to X-Ray by Dr. A.K. Aggarwal (PW-8), who was posted as Radiologist in District Hospital, Bulandshahr. It has been proved on record by Dr. Jitendra Singh Sharma (PW-7) that Dharam Prakash remained in the hospital from 9 February 1975 to 20 March 1975.

25. *The medical evidence clearly reflected that the injuries could be caused by gun shots. However, there was little difference of opinion between two doctors but both these doctors are not ballistics experts so as to provide any expert opinion which could safely be relied upon by the Court while deciding the case.*

26. *The difference of opinion between experts necessarily may not persuade the Court to adopt one approach or the other particularly when none of the experts are persons competent to express opinion on that subject. The difference of opinion between two doctors which, in the facts and circumstances of the present case, does not have any material bearing on the case of the prosecution is not such a formidable submission which has to be accepted by the Court to grant necessarily the benefit of doubt to the accused.*

It was stated by Dr. Suresh Chandra Singh (PW-5) that such injuries could be caused by gun shots. The trial court and the High Court expressed in unambiguous language the view that it was possible that no gunpowder was traced around the wounds of the injuries as he was wearing clothes. This finding cannot be said to be erroneous. Dr. A.K. Agarwal (PW-8) clearly stated that the pellets of the fire shots were found in the wounds and were duly seen in the X-Ray of the injured. Thus such view taken by the courts cannot be faulted. *In fact the major part of the occurrence is not even disputed by the accused in his statement under section 313 of Cr PC and in any case the report lodged by him bearing No. 27A/75 clearly shows that the incident occurred and the injured besides, other two witnesses, PW-1 and PW-2 were present at the spot. In fact according to the accused it was an accidental fire which occurred as a result of snatching of the gun by the injured and other persons accompanying him at that time.* While, according to the prosecution he had fired two shots which injured the victim and thereafter the gun was snatched. Dr. Suresh Chandra Singh (PW-5) examined the injuries of the injured and stated that injuries would have been caused 2-3 hours earlier and that when the injured was brought to the hospital, he was bleeding and such injuries could be sustained by gun shots. This statement of the doctor had fully supported the case of the prosecution and chain of events as stated therein.

29. With considerable emphasis, learned counsel for the appellant argued that as no explanation was rendered by the prosecution as to how the gun had broken, this would straightaway cause serious dent in the case of the prosecution and entitles the accused for an acquittal.

30. We find no merit in the aforesaid contention. It was for the accused to prove his defence as the prosecution is liable to prove the case as stated in the first information report and the report filed by it under section 173 of Cr PC The eye-witnesses had actually seen the victim being injured by the shots fired by the accused. In fact the accused was apprehended at the spot with the gun. The gun in question was admittedly a double barrel gun and the same was used by the accused while firing two shots. The gun with the spent cartridges were taken into custody *vide* Ext. Ka-3. The accused himself had lodged the report bearing No. 27A/75 under section 394 of the Indian Penal Code against the eyewitnesses including Bhanu Prakash Sharma, Dharam Prakash, Rama Shankar and one

unknown person. The report lodged by the accused, itself shows as to how the gun was broken. But the breaking incident took place after the two shots had been fired by the accused upon the injured. There appears to be no justifiable reason as to why the eye-witnesses PW-1 and PW-4, who even according to the accused were present at the place of occurrence, should be disbelieved.

It could be safely construed from the evidence on record that the accused may not have any strong motive to kill the victim, however, the loss of revenue on account of the fact that water for irrigation was being provided by the father of the injured, was reason enough for the accused to show his anger or it was not acceptable to him, as stated by the witnesses, thus he fired two shots which resulted in causing injuries to Dharam Prakash.

Both the reports were lodged by the informant as well as the accused at 2.30 pm on 9 February 1975. The gun and the utilized bullets were given at the police station itself. This evidence clearly shows that the prosecution has not failed in proving its case in accordance with law.

31. As already noticed, part of the occurrence stands admitted and it is only the limited aspect of the case as to whether the firing was accidental or the accused had intentionally fired on the injured. Statement of the eye-witnesses, medical evidence and the investigation conducted by the Investigating Officer clearly show that the prosecution has been able to prove its case beyond reasonable doubt. The act of firing gun shots at the injured obviously shows that the accused had the knowledge that by such an act he may even cause the death of the injured and actually caused hurt to the victim. It is a matter of co-incidence that the gun shots did not injure Dharam Prakash at any of his vital organs.

32. Learned counsel appearing for the appellant while referring to certain discrepancies appearing in the statements of the witnesses including the doctors, vehemently contended that it was a case of acquittal and there was no intention on the part of the accused to kill the injured otherwise he would have fired the gun shots at the vital parts of the body of the injured, particularly when according to the prosecution, it is stated that the firing took place from a close distance. If that was so, such injuries would not have been caused. This contention also does not impress us inasmuch the tattooing and charring shall always depend upon the constituents of the propellant charge and it is in that context only wounds are classified by their external appearance as close contact. Reference can be made to *Bano Prasad v State of Bihar*, (2006) 12 Scale 354 : 2007 AIR SCW 807 : AIR 2007 SC 1021.

* * *

The cumulative effect of the above discussion is that we do not see any reason to interfere with the judgment of the High Court. The High Court has not exceeded its jurisdiction in law and with reference to the evidence on record while reversing the judgment of acquittal to one as that of conviction. So far as the conviction of the accused under section 25(1) of the Act is concerned, no arguments were addressed. In any case we see no reason to interfere with the said finding of the courts below.

35. In the result, the appeal fails and is dismissed.

8.20.6 Medico-legal expert No Ballistics Experts[25]

Author's Summary

It is a case of murder. Two culprits had guns and fired 4 shots. The victim died at the spot. The accused alleged that they have been framed. The medical evidence and the eyewitness accounts were at variance. The doctor found bullet injury on the deceased whereas the accused had only 12 bore shotguns. The SC rejected the argument and ruled:

"The Medico-legal expert is not ballistic expert. He was not expected to answer as to whether injury No. 1 could have been caused by bullet alone."

Highlights italicised

Relevant Extracts (Verbatim)

Put briefly the prosecution case is as follows:

On 19 February 1977 at about 4.45 pm the accused Ram Samujh and Mahmood appellant No. 1 both armed with guns, Khalid-appellant No. 2, Bajrang and one unidentified person armed with *lathi* assaulted deceased Ram Singh at Galiyara near the fields of Ram Sewak Ahir, while he was returning to his village Badipur on his motorcycle. It was alleged that the accused Ram Samujh and Mahmood fired four shots, as a result of which the deceased fell down injured and thereafter Khaliq snatched the licensed revolver belonging to the deceased and all the five fled away from the scene. Ram Singh died on the spot. The incident of murderous, attack was witnessed by Jaikirat Singh (PW-1) who is none other than the son of deceased-Ram Singh, Ram Ratan (PW-2), resident of village Sujerpur hamlet of Bodipur and Ram Adhar (P.W3). PW-1 lodged written First Information Report Ext Ka. 1 on the same day at 4.45 pm naming all the accused and the manner in which the murderous attack on the deceased had taken place, Jagdamba Prasad Dwivedi (PW-7) the office in-charge of Police station, Kothi rushed to the scene of offence at about 6.00 pm and found the dead body of Ram Singh and his motorcycle in *galiyara* near the fields of Ram Sewak Ahir. The broken pieces of the skull of the deceased and broken three teeth were seized from the place of occurrence. The discharged cartridge and tickli were also seized from the spot. PW-7, after preparing the Inquest Report (Ext. Ka. 7), sent the dead body for conducting post-mortem, Dr. R.S. Katiyar PW-5 performed the autopsy on the dead body on 20 February 1977 at about 9.45 am and found as many as five ante-mortem gunshot wounds. A cap of cartridge (top wad?) was extricated from the brain of the deceased. Scalp bones were found fractured. It was found that vital organs like peritoneum, liver, kidneys were badly ruptured. In the opinion of the doctor, the cause, of death was due to shock and haemorrhage resulting from ante-mortem injuries. The investigation of the case was transferred in the first week of March, 1977 to CB 'CID, Inspector M.L. Gautam having completed rest of the investigation submitted charge-sheet against the appellants and other accused.

The accused have denied the charges framed against them and took the plea that they have been falsely implicated due to enmity. The accused were accordingly put on trial. The prosecution in order to establish its case in altogether examined 8 witnesses and got marked 39 documents as Exts. Ka. 1-39. Amongst the witnesses examined by the prosecution, Jaikirat Singh, Ram Ratan and Ram Adhar (P.Ws. 1, 2 and 3) respectively were eyewitnesses to the

25. *Mahmood v State of Utter Pradesh,* AIR 2008 SC 515 : 2007 AIR SCW 7385 : 2008 Cri LJ 696 (SC).

murderous attack on the deceased. The accused also led evidence and examined Virendra Singh DW-1, Laxmi Narain Sinha DW-2 and Bindra Charan DW-3.

The learned Sessions Judge upon the appreciation of the oral evidence and material on record found all the accused guilty of the charges framed against them and sentenced them to various terms of imprisonment. On appeal the High Court of Allahabad confirmed the conviction and sentences imposed by the learned Sessions Judge. The appellants who are accused Nos. 2 and 3 respectively alone have preferred this appeal by special leave, challenging their conviction and sentence.

The prosecution story entirely rests upon the direct evidence of PW Nos. 1, 2 and 3. PW-1 is none other than the son of deceased Ram Singh. He was present in his fields situated nearby the place of occurrence where his father was attacked, Jaikirat (PW-1) no doubt was doing his part time G.N.S. in plantation at Lucknow but that itself would not make his presence doubtful at the scene of offence on the fateful day. The defence did not elicit anything in the cross-examination casting any doubt about the presence of PW-1 at the scene of offence. There is nothing unnatural about the conduct of PW-1 at the scene of occurrence. He gave a detailed version as to the manner of assault and the role played by each of the accused. The names of PW-2 and PW-3 were also mentioned as eyewitnesses in the First Information Report itself. In the circumstances, PW-2 and PW-3 cannot be treated as chance witnesses. The Trial Court and as well as the High Court did not commit any error in relying on the testimony of PW-2 and PW-3 as eyewitnesses of the occurrence which fully stands corroborated with the testimony of PW-1. Be that as it may, there was not even a suggestion to PW-2 and PW-3 that they had animosity towards the accused persons. They are independent witnesses and there is no reason for them to speak against the accused.

However, it was strenuously urged that the presence of Jaikirat (PW-1) at the scene of offence is highly doubtful as he made no attempt whatsoever to save his father from being further assaulted. We find no substance in this contention. It is in the evidence of Jaikirat (PW-1) that all the four shots were fired in quick succession and at that moment PW-1 was at some distance from the actual place of attack. Be it noted that at least 2 accused were armed with firearms and one with lathi and they were using the weapons with all impunity. In such circumstances, Jaikirat (PW-1) may not have mustered his courage to jump into the fray and risk his own life. It is very difficult to predict or express any opinion as to what could have been normal or natural conduct of a person in such a situation. The response of individuals in such situations may differ from person to person. It is not possible to reject the evidence or doubt the presence of PW-1 on that ground.

The post-mortem examination of the deceased Ram Singh was performed by Dr. R.S. Katiyar (PW-5). The post-mortem report is exhibit Ka-4. The Medico-legal expert found the following ante-mortem injuries on the person of the deceased:

1. A gunshot wound (wound of entry) 3 cm x 1 cm found over left side of face just above the left side of the lower lip. Wound of Ext. 3 cm x 2 cm. over the right parietal bone, 7 cm. above the right ear.
2. A gunshot wound 2.5 cm x 1 cm. over the right side of face below max. prominence.
3. Multiple gunshot wounds in an area of 13 cm. x 11 cm. over the right side of back below the inferior angle of scapula.
4. A gunshot wound (wound of entry) 2 cm. x 2 cm. over the right side of the back 2 cm. Right to 12th thoracic vertebra.
5. Multiple gunshot wounds in an area of 9 cm. X 4 cm. over the back and middle of right arm.

Relying on his evidence the learned counsel for the appellant contended that the oral account as given by PW-1, 2 and 3 is at variance with medical evidence available on record. It is contended *that while according to the eye-witnesses all the four shots were fired from the gun, from right side of the victim, wound No. 1 (wound of entry) was on the left side of the face and caused by bullet and this evidence belies the claim of eye-witnesses that they saw the assault on Ram Singh. It is true that to a pointed query in cross-examination as regards the nature of injury No. 1, the Medico-legal expert stated that the said injury was caused by bullet only.* ***The learned counsel contended that weapons in the hands of the Accused even according to PW-1 were of 12 bore guns and not any pistols or revolvers. No bullet injury could have been caused with the firearms that were alleged to be in the hands of the assailants. We find no substance in this submission. The Medico-legal expert is not a ballistic expert. He was not expected to answer as to whether injury No. 1 could have been caused by bullet alone. His opinion to that extent is of no consequence.*** *It is well-settled that medical evidence is only an evidence of opinion and it is not conclusive and when oral evidence is found to be inconsistent with the medical opinion, the question of relying upon one or the other would depend upon the facts and circumstances of each case. No hard and fast rule can be laid down therefor. The ocular evidence if otherwise is acceptable has to be given importance over medical opinion. However, where the medical evidence is totally improbableles the ocular version, the same can be taken to be a factor to affect credibility of the prosecution version. We are not inclined to place any reliance upon the opinion of the Medico-legal expert that the injury No. 1 could have been caused only with bullet since he is not a ballistic expert. This part of the evidence of the Medico-legal expert cannot be considered to be the opinion of an expert and the same has no evidentiary value. It is not possible to disbelieve the evidence of PWs.-2 and 3 and their presence at the scene of occurrence based on the medical evidence. The High Court rightly observed that the controversy as regards injury No. 1 and whether the same could have been caused by bullet or pellet to be without any basis.*

The learned counsel for the State rightly contended that in case of attack by members of unlawful assembly on the victim in furtherance of common object, it is not necessary for the prosecution to establish overt act done by each accused. It is required to be noticed that Ram Singh (A-1) who had fired two shots, convicted by the Sessions Court, did not even challenge his conviction in the High Court. The appellants have been rightly convicted under section 302 read with aid of section 149 of IPC PW-5 in his evidence stated that all the injuries sustained by the deceased were from gun. It is further stated that from the body of deceased one bullet, one cover *tikli*, two dat and 40 '*chare*' shots were taken out, put in packet and sealed … "It is also stated in his evidence that injuries caused on the body of the deceased were sufficient in the normal course to cause death. This part of the medical evidence if juxtaposed with the oral evidence of PWs-1, 2 and 3 it becomes unnecessary to go into the question as to which accused caused what injury and which was a fatal one. Once a membership of an unlawful assembly is established, it is not incumbent on the prosecution to establish any specific overt act to any of the accused for fastening of liability with the aid of section 149 of the IPC. Commission of overt-act by each member of the unlawful assembly is not necessary. The common object of the unlawful assembly of the accused in the present case is evident from the fact that some of them were armed with deadly weapons. None of them were curious onlookers or spectators to the macabre drama that was enacted on 19 February 1977 at 3.30 pm at galiyara, village Badipur.

For the aforesaid reasons, we find no merit in this appeal. The appeal is accordingly dismissed.

8.20.7 Close-range Phenomena[26]

Author's Summary

It is a case of murder of wife with a revolver and an extraordinary conviction on circumstantial evidence, maintained by the SC. There were no eyewitnesses, the firearm was not linked to the culprit or to the bullet recovered from the victim.

The evidence relied upon was that the culprit had written a threatening letter, the firing was a close-range phenomenon and there was no possibility of any other person to be nearby. The SC ruled out Suicide

Highlights italicised

Relevant Extracts (Verbatim)

The prosecution case is when the deceased had gone upstairs with the dinner of the respondent, a sound of a gunfire was heard by the informant at the first floor. PW-3 rushed to the second floor immediately and found the deceased lying in a pool of blood on the terrace having a gunshot injury. Allegedly, he exclaimed *"didi ko kisee nei goli mar diya".* Hearing these words, the parents of the deceased also rushed to the second floor and found her lying on the terrace in the pool of blood with a gunshot injury on her forehead. The Respondent was seen hiding something by PW-2. When the mother of the deceased Gouri Devi (PW-2) took the deceased's head on her lap, the respondent also came out. She was brought downstairs and taken to a nursing home. The Respondent was also said to have accompanied them in a rickshaw. She was declared dead. Before the deceased was taken to the nursing home, PW-2 had locked the room from outside.

Information about the said incident was lodged by Raj Kumar Prasad Tamarkar, the father of the deceased (PW-13).

The investigating officer, on opening the lock, found a revolver from which smoke was still coming out. It was found from the bedstead of the room.

The respondent was arrested. Principal witnesses examined on behalf of the prosecution to prove the offence against the respondent before the learned Sessions Judge were PW-2, PW-3 and PW-13, mother, brother and the informant-father of the deceased respectively. Indisputably, they were present in the house when the occurrence had taken place. The autopsy report was prepared by Dr. Kaushlendra Kumar (PW-1) posted at Sadar Hospital, Giridih. He found the following injuries on the person of the deceased:

(i) one circular lacerated wound over glabella (middle of forehead) ½" x ½" cranial cavity deep with inverted margin, blackening and charring was present.

(ii) Cresentric mark over the side of the nose (left) below left eye – nail mark. On further dissection – subcutaneous tissues under the lacerated wound on the forehead in middle *'i.e.* Glabella region and the underlying frontal bone consisted a circular hole ½" x ½" Cranial cavity deep. On further dissection the meninges and the brain were lacerated and terro posteriorly with extracranial blood clot. One bullet was taken out from the posterior cranial fossa. The bullet was sealed and handed over the investigating agency.

Bharti Devi (PW-4) was the aunt of the deceased, *i.e.,* the brother's wife of the informant (PW-13). She was staying in the same house. She deposed that at the relevant time the respondent was staying in the house and he had come asking for Bidai of the deceased. Suresh Kumar (PW-3) is another brother of the informant living in the same house. He was informed by the

26. *Raj Kumar Prasad Tamarkar v State of Bihar,* AIR 2007 SC (Supp) 372 : (2007) 10 SCC 433.

informant that it was the respondent who was responsible for the death of his daughter (the deceased).

Kameshwar Prasad (PW-5) is another brother of the informant who was also living in the same house. He also supported PW-3. Bishwanath Sharma (PW-7) was a neighbour who came to the place upon hearing commotion. To him also the occurrence was reported by the informant. Kali Prasad Sao (PW-8), Shambhu Prasad (PW-9), Surender Sao (PW-10) and Ramdeo Prasad Yadav (PW-11) were witnesses of seizure of a blood-stained revolver from the bedstead of the room which was being occupied by the respondent at the relevant time. Shesil David Khalkho (PW-12) is a Sargeant Major. He had examined the seized revolver and opined that the same had been in a working condition and had been used recently. He examined himself as PW-12.

The learned Sessions Judge on the basis of the aforementioned evidence found the respondent guilty of commission of murder and sentenced him to undergo rigorous imprisonment for life.

The said judgment having been appealed against has been reversed by the High Court by reason of the impugned judgment. The High Court was of the opinion that the circumstance obtained in the prosecution case could not be said to have connected all the links in the chain. The High Court also noticed that there was no eye-witness to the occurrence.

The circumstances which have been found by the learned Sessions Judge to prove the involvement of the respondent in the case are as under:

> *(i) The marriage between the accused-appellant and the deceased was solemnized some time prior to the occurrence and the accused appellant although visited Calcutta in course of his duty but he did not meet his wife Usha Devi, the deceased, in Calcutta while she was residing at her Nanihal at Bhawanipur.*
>
> *(ii) At the time of occurrence in the upstairs of the house only the accused appellant and the deceased were present. There was none other than them.*
>
> *(iii) Soon after the occurrence when the inmates of the house went upstairs hearing the sound of firing, the accused appellant was in the room while the deceased, Usha Devi, was lying with gunshot injury in a pool of blood on the terrace and he was found concealing something inside the bedstead.*
>
> *(iv) On examination of the seized revolver it was found to be an able one and recently it was used as still there was smell of firing in the barrel.*
>
> *(v) The accused-appellant was having some illicit relationship with one lady, namely, Sahnaj and only with the ulterior motive of clearing his path of illicit relationship with Sahnaj, Usha Devi was murdered. A letter to that effect as alleged was written by the accused appellant to the deceased had been proved in the case.*

We have noticed hereinbefore certain admitted facts which we need not advert to once over again.

No positive defence was taken by the respondent. Merely a suggestion was given while cross-examining the prosecution witnesses that the deceased might have been killed by an outsider.

> *Our attention was drawn to a letter dated 30 October 1995 (Ext. 7) written by the respondent to the deceased. In that letter indisputably the respondent had warned the deceased of grave consequences if she continued to accuse him in regard to his affair with Shahnaj.*

The learned Judges of the High Court opined that there was nothing to show that the revolver belonged to the respondent, particularly, when the same had not been sent to a ballistic expert nor the blood which was found thereupon was sent for chemical examination.

The High Court moreover opined that nobody had stated that the revolver was kept in the jhola which was carried by the respondent. It was furthermore observed that the room wherein the respondent was staying cannot be said to be in his exclusive possession and, thus, if anything incriminating had been found therein, the same could not "finger towards the conscious possession" of the respondent. It was furthermore opined that the fired bullet recovered from the body of the deceased having not been sent for chemical examination along with the revolver to prove that the same had been fired from the revolver seized; there remained a gap constituting a missing link.

> *Ext. 7 was proved to be in the handwriting of the respondent. The contents of the said letter are not in dispute. It contained threatening to the deceased. She was warned of grave consequences even to the extent of killing her.*
>
> *The conspectus of the events which had been noticed by the learned Sessions Judge as also by the High Court categorically goes to show that at the time when the occurrence took place, the deceased and the respondent only were in the bedroom and the terrace connecting the same. There was no other person. The cause of death of the deceased Usha Devi i.e., by a gunshot injury is not disputed. The fact that the terrace and the bedroom are adjoining each other is not in dispute.*
>
> *The autopsy report shows that "a blackening and charring" existed so far as injury No. (i) is concerned. The blackening and charring keeping in view the nature of the firearm, which is said to have been used clearly go to show that a shot was fired from a short distance. Blackening or charring is possible when a shot is fired from a distance of about 2 feet to 3 feet. It, therefore, cannot be a case where the death might have been caused by somebody by firing a shot at the deceased from a distance of more than 6 feet. The place of injury is also important. The lacerated wound was found over glabella (middle of forehead). It goes a long way to show that the same must have been done by a person who wanted to kill the deceased from a short distance. There was, thus, a remote possibility of causation of such type of injury by any other person, who was not on the terrace.*

Once the prosecution has been able to show that at the relevant time, the room and terrace were in exclusive occupation of the couple, the burden of proof lay upon the respondent to show under what circumstances death was caused to his wife. The *onus* was on him. He failed to discharge the same.

The observation of the High Court that the respondent had not been proved to be in possession of the revolver cannot be accepted. The respondent at the relevant time was with the deceased. In the event, the death has been caused by an outsider, he could have shouted. He would have been the first person to point out to her in-laws as to from which side the shot was fired. Even he could have been the first person to offer his explanation to the investigating officer. He chose not to do so.

The respondent was found to be hiding something under the bedstead by his mother-in-law. It may be true that PW-3 brother of the deceased when he came to the room shouted that somebody had killed his elder sister but the same would not mean that even if the circumstances are so glaringly pointing out the guilt of the accused and accused alone, the same should be ignored only because of the said statement.

Other brothers of PW-13 including PW-4 came to the spot immediately. PW-7 who was the neighbour also came to the spot immediately after the incident. To them also the respondent did not offer any explanation. To them also he did not say as to how his wife had suffered a gunshot injury.

The prosecution case that while taking the deceased to the nursing home, the mother of the deceased locked the door from outside has not been disputed. The lock of the door was indisputably opened in the presence of the investigating officer. Recovery of the revolver being the weapon of attack is also not in dispute. The fact that the injury could have been caused only by the weapon in question is also not in dispute. The same was not only found to be in working condition, it was also found by the investigating officer as also PW-12 that the same had been used recently.

We may also notice that the defence suggested that the deceased might have committed a suicide. It was furthermore suggested that some family members might have committed the offence. The learned Sessions Judge found, which finding is not questioned before us, that keeping in view the place where the dead body was found, the suicide theory is wholly improbable. The bangles of the deceased were found broken. If she had committed suicide in the room, it was impossible for her to run to the terrace. It was impossible that the pistol would be found hidden under a bedstead in the room which is admittedly at some distance from the place where the deceased was found lying.

It is difficult to accept the submissions of Mr. Banerjee that had the respondent fired the shot, he could have thrown away the revolver. Under what circumstances the respondent did so can only be a subject-matter of surmises. It is well-known that different persons behave differently in a given situation. It is just possible that even if the revolver had been thrown, the same would have been found immediately.

Mr. Banerjee contended that the room was not in the exclusive possession of the respondent. It may be that the room was not in the exclusive possession of the respondent in the sense that he had not been living there permanently but it had not been denied or disputed that at the relevant time the deceased and the respondent were alone in the room. No other person was present there. Even the witnesses were not cross-examined on that behalf. No suggestion even had been given to that effect.

It was argued that if the respondent intended to kill the deceased, he could have done so after 17 July 1996 *viz.,* after Bidai ceremony took place. The very fact that the respondent brought a revolver is itself a pointer to the fact that he wanted to kill the deceased at one point of time or the other. He might have thought that Bidai ceremony would be held on 13 July 1996 or 14 July 1996. When it was postponed, he might have found out an occasion to kill her. Under what circumstances, the occurrence took place is not known. The respondent, it would bear repetition to state, did not open his mouth. He was entitled to exercise the right of silence. That he did not offer any explanation itself may not be sufficient to conclusively hold that he was guilty of commission of the offence, but the legal position that the same would be considered to be a circumstance against him is not in dispute.

It is true that neither any fingerprint expert nor any ballistic expert had been examined. Even the blood found on the revolver had not been sent for chemical examination, but, in our opinion, the same by itself would not negate the circumstances which have proved the guilt of the respondent beyond all reasonable doubt.

For the reasons aforementioned, we set aside the judgment of the High Court and restore that of the learned Sessions Judge. The appeals are allowed. The respondent is sentenced to undergo rigorous imprisonment for life under section 302 of the Indian Penal Code. He may be taken in custody forthwith to serve out the sentence.

8.20.8 Blackening and Inversion of Edges[27]

Author's Summary

It is a case of murder where the postmortem doctor caused confusion. In the PM report he stated, 'the margin of wound charred. A t another point, he in no uncertain terms stated that firing was done from long range and distance of firing would be from more than six feet.

The doctor confused **dirt ring** (can occur from any distance) to **"charring"** and created the comedy of error.

Highlights italicised

Relevant Extracts (Verbatim)

On 13 December 1999 at about 6.30 am, the deceased was milking a buffalo. His other family members including the wife of his brother (informant Krishna Deo Prasad-PW-7), nephew Sunil Prasad and others were brushing their teeth at the roof of their house. Brijnandan Prasad and others have their joint residential house at some distance from the house of the deceased. They allegedly came over the roof of their house armed with rifles and started brick-batting and abusing the brother of the informant alleging that they had burnt a heap of straw belonging to them. When Shivnandan Prasad went to the roof of the house, allegedly the appellants started firing. One of the bullets hit Shivnandan Prasad on his chest. An alarm was raised. The first informant reached near his brother and found him dead. A First Information Report was lodged at about 10.00 am on the same day before Chandi Police Station.

* * *

The learned Sessions Judge relying on or on the basis of the evidence adduced by the prosecution and in particular the deposition of the eye-witnesses found the appellants guilty of commission of an offence under section 302/34 of the Indian Penal Code and sentenced them to undergo rigorous imprisonment for life. A fine of Rs 5,000 was also imposed upon each of them. They were also found guilty under section 27 of the Arms Act and were convicted to undergo rigorous imprisonment for one year. The appeals preferred by the appellants have been dismissed by a Division Bench of the High Court.

* * *

So far as the contention in regard to distance of firing is concerned, it is true, ordinarily, charring would take place, if firing is done from a distance of less than four feet, as has been noticed in some of judgments of this Court in *Subhash v State of Uttar Pradesh,* (1976) 3 SCC 629 : 1976 Cr LJ 1521 : AIR 1976 SC 1924; *Nath Singh v State of Uttar Pradesh,* (1980) 4 SCC 402; *State of Punjab v Wassan Singh*, (1981) 2 SCC 1 : AIR 1981 SC 697 : 1981 Cr LJ 410; and *Sidharth v State of Bihar*, (2005) 12 SCC 545 : AIR 2005 SC 4352 : 2005 Cr LJ 4499.

In some cases, medical evidence may corroborate the prosecution witnesses; in some it may not. The court, however, cannot apply any universal rule whether ocular evidence would be relied upon or the medical evidence, as the same will depend upon the facts and circumstances of each case. No hard and fast rule can be laid down therefor.

27. *Bano Prasad v State of Bihar,* AIR 2007 SC 1019 : 2007 SCW 801.

It is axiomatic, however, that when some discrepancies are found in the ocular evidence *vis-a-vis* medical evidence, the defence should seek an explanation from the doctor. He should be confronted with the charge that he has committed a mistake. Instances are not unknown where the doctor has rectified the mistake committed by him while writing the post-mortem report, (in the instant case) whereas in the body of the post-mortem report, the medical expert stated, 'the margin of wound charred and inverted' at another point, he in no uncertain terms stated that firing was done from long range and distance of firing would be from more than six feet. The possibility, therefore, of his commission of some mistake in the post-mortem report cannot be ruled out. It was on the said premise, it was incumbent upon the defence to bring the said fact to the notice of the doctor. Probably, knowing the futility of asking such a question, no such contention was raised either before the Sessions Judge or before the High Court. No such ground has also been taken before us.

> *Tattooing or charring shall depend upon the constituents of the propellant charge. It is in that context only wounds are classified by their external appearance as close contact, near contact and distant. The doctor in his evidence was categorical in stating that the wounds would not come within the purview of classification of near contact; but the wounds should be classified under 'distant contact'.*

The authorities like Taylor and HWV Cox in their treatises, state in details as to how the post-mortem examination should be conducted.

The nature of the gun will also have a role to play. Unfortunately, the investigating officer did not make any attempt even to seize the gun. When the weapon was not seized, the question of examination of any ballistic expert would not arise [See *Nirmal Singh v State of Bihar*, (2005) 9 SCC 725].

8.20.9 Common Intention from Injuries[28]

Author's Summary

It is a case of murder where the postmortem doctor found one firearm injury on the deceased. There were no other injuries on the decease or others. Nor was there any evidence(marks) on the crime scene.

No other person suffered any injury. The SC, therefore, did not accept the prosecution plea of common intention with others.

Highlights italicised

Relevant Extracts (Verbatim)

The homicidal nature of the death of the deceased is not in dispute. The autopsy report of Dr. Prabhat Keshaw corroborates the homicidal nature of death. In his deposition, he stated:

"*Rigour mortis* present in all four limbs.

28. *Bano Prasad v State of Bihar*, AIR 2007 SC 1019 : 2007 SCW 801.

Injury No.

i. One lacerated wound on the occipital region on scalp 1½" x 1" x scalp deep.

ii. One lacerated wound on right side of chest at the length of second inter-coastal space 1½" lateral to the external margin 2" x 1" x cavity deep size, margin of wound charred and inverted, wound of entry.

iii. Third rib fractured.

iv. One lacerated wound on left side of back at bare area, just below the lower border of scapula 1½" x 1" x cavity deep size, margin of wound everted, wound of exit. Both injury Nos. II & IV are inter-connected with each other.

On dissection, skull, brain and brain matter intact, right lung perforated, left lung intact, arch of aorata intact contents 3-4 ounces of undigested food materials, liver, splin, both kidneys intact, gasses ficle matters present in small and large intestine respectively. The bladder was half full. Time elapse since death within 24 hours.

In my opinion death occurred due to shock and haemorrhage caused by above-noted injury caused by firearm or may be by rifle. The above-noted injuries are sufficient for death. This post-mortem report is in my pen and signature mark Exh. 4."

In his cross-examination, he stated that the distance of firing was more than 6 feet and was from long range, *i.e.,* beyond 6 feet; although he could not say the exact distance. He, however, could not state that the injury was from parallel height or from higher height. In regard to the presence of *rigour mortis*, it was stated:

> The start of *rigour mortis* depends on the temperature and weather conditions, but in this case *rigour mortis* developed after three hours. In all turn limbs developing of *rigour mortis* take 18 hours in such types of cases.

The deceased met instantaneous death. Although the investigation was conducted in a slipshod manner, but the presence of blood at the spot of occurrence as also seizure thereof had categorically been stated by PW-4, PW-5, 'PW-6, PW-7, PW-8 and PW-2. PW-2, Kapil Prasad is an independent witness. He categorically stated:

"Blood stained soil and brick bats were also seized by the police in my presence and prepared the seizure list".

It is, thus, not correct to say that no blood was found at the spot.

He reiterated his statement in the cross-examination in the following terms:

"The police seized blood stained soil, bricks, in my presence. I cannot say the length and breadth of the bricks. I do not remember the area of the place from where the blood was seized. The soil might be 4-5 hundred grams."

We may also notice that in the First Information Report, it was categorically stated that the appellants herein had indulged in brick batting. The statement to the said effect was proved by PW-4, PW-5, PW-6, PW-7, PW-8 and other eye-witnesses in their depositions before the court. This part of the prosecution is not under challenge before us.

We may also notice the fact that there had been firing from the side of the appellants has not only been disclosed in the First Information Report but also stated by the witnesses. We would, however, examine the effect of the depositions of the said witnesses, in this behalf, a little later.

We may notice that according to PW-3, the firing took place from a distance of about 50-60 feet, whereas according to PW-4, the distance was anything between 40-45 feet. Both PW-7 and PW-8 stated that the distance from which the firing took place was about 40-45 feet.

It is also not in dispute that whereas prosecution witnesses PW-4, PW-7 and PW-8 also stated that the appellants were in the second floor of their house, whereas the deceased, informant and others were in the first floor of their house. However, the difference of height of the respective buildings is not brought on records.

The discrepancies between the medical evidence and ocular evidence, however, as noticed hereinbefore, have been raised on two counts namely, (i) *rigour mortis* in four limbs were found; and (ii) in view of the injury sustained by the deceased, the firing must have taken place from a close distance.

We must, however, state that before the High Court, the second contention was not raised. Even before the learned Sessions Judge the only contention raised was in regard to the time of death and with reference to the presence of *rigour mortis* in all the four limbs. In the grounds of the Special Leave Petition also, the question in regard to the possibility of the deceased having been fired upon from a close distance has not been raised.

So far as the contention in regard to distance of firing is concerned, it is true, ordinarily, charring would take place, if firing is done from a distance of less than four feet, as has been noticed in some of judgments of this Court in *Subhash v State of Uttar Pradesh,* (1976) 3 SCC 629 : 1976 Cr LJ 1521 : AIR 1976 SC 1924; *Nath Singh v State of Uttar Pradesh,* (1980) 4 SCC 402; *State of Punjab v Wassan Singh,* (1981) 2 SCC 1 : AIR 1981 SC 697 : 1981 Cr LJ 410 and *Sidharth v State of Bihar,* (2005) 12 SCC 545 : AIR 2005 SC 4352 : 2005 Cr LJ 4499.

In some cases, medical evidence may corroborate the prosecution witnesses; in some it may not. The court, however, cannot apply any universal rule whether ocular evidence would be relied upon or the medical evidence, as the same will depend upon the facts and circumstances of each case. No hard and fast rule can be laid down therefor.

It is axiomatic, however, that when some discrepancies are found in the ocular evidence *vis-a-vis* medical evidence, the defence should seek for an explanation from the doctor. He should be confronted with the charge that he has committed a mistake. Instances are not unknown where the doctor has rectified the mistake committed by him while writing the post-mortem report.

In *Surinder Singh v State of Uttar Pradesh,* (2003) 10 SCC 26 : AIR 2003 SC 3811 : 2003 AIR SCW 4364, it was held:

> One of the pleas raised by learned counsel for the appellants was that the injuries as noticed by the doctor are at variance with the ocular evidence. On a close reading of the evidence of eye-witnesses and the doctor's report there is no noticeable variance. The mere fact that the doctor said that injuries appeared to be on one side of the body and the witnesses said that attacks were from different sides, is too trifle an aspect. When three persons are attacking a person, the witnesses naturally get shocked. This is normal human conduct and the immediate reaction is to save the victim and to stop the assailants from further attacks. That is precisely what has been done by the eye-witnesses. It is only when the medical evidence totally improbabilities the ocular evidence, that the Court starts suspecting the veracity of the evidence and not otherwise. *See* also *State of Karnataka v Papanaika,* (2004) 13 SCC 180 : AIR 2004 SC 4967 : 2004 Cr LJ 4667.

In *Anwar v State of Haryana,* (1997) 9 SCC 766 : 1997 All Cri R 529 : JT 1997 (3) SC 1, this Court observed:

> It is true that Dr. Jai Kishan (PW-9) who conducted the autopsy in his post-mortem examination report described Injury 1 as being incised wound 20 cms x 2 cms causing fracture of the underlying bone. He further noticed lacerated wounds on the neck of the right ear of the size 1 cm x one-second cm causing fracture of the underlying bone. While giving evidence in the court, he described an incised wound as Injury 1 and lacerated wounds as Injury 1-A. He further testified that it was a *bona fide* mistake in not describing these two injuries separately. Mr. Sushil Kumar urged that Dr. Jai Kishan (PW-9) has made a material improvement in his evidence before the court to suit the prosecution and to lend

> support to the evidence of eye-witnesses and, therefore, such an improved version which demolishes the evidence of eye-witnesses be not accepted. This submission, is an attractive one but having regard to the facts and circumstances of this case, it is not possible to accept the same. The consistent evidence of both these eye-witnesses was that A-2 had fired from his pistol on Baddal causing firearm injuries on his head and this evidence, in our opinion, is quite a credible one. Both these witnesses have referred to the firearm injury on Baddal on his head whereas lacerated wounds were found behind the right ear. In an assault of this nature, the exact description as regard to location of the firearm injury might be not accurate but that by itself would not render their evidence untrustworthy. It needs to be mentioned that the medical evidence is an opinion evidence which is used to lend corroboration to the evidence of eye-witnesses. If the medical evidence is found to be totally inconsistent with the ocular evidence on a given set of facts, it would be permissible for the court to reject the ocular evidence. As far as the facts of the present case are concerned as pointed out earlier, the inconsistency between the ocular evidence and the medical evidence is of a very minor nature and we do not think it proper to reject the evidence of these two eye-witnesses on that score. [Emphasis supplied]

Whereas in the body of the post-mortem report, the medical expert stated, 'the margin of wound charred and inverted' at another point, he in no uncertain terms stated that firing was done from long range and distance of firing would be from more than six feet. The possibility, therefore, of his commission of some mistake in the post-mortem report cannot be ruled out. It was on the said premise, it was incumbent upon the defence to bring the said fact to the notice of the doctor. Probably, knowing the futility of asking such a question, no such contention was raised either before the Sessions Judge or before the High Court. No such ground has also been taken before us.

Tattooing or charring shall depend upon the constituents of the propellant charge. It is in that context only wounds are classified by their external appearance as close contact, near contact and distant.

The doctor in his evidence was categorical in stating that the wounds would not come within the purview of classification of near contact; but the wounds should be classified under 'distant contact'.

The authorities like Taylor and HWV Cox in their treatises, state in details as to how the post-mortem examination should be conducted.

The nature of the gun will also have a role to play. Unfortunately, the investigating officer did not make any attempt even to seize the gun. When the weapon was not seized, the question of examination of any ballistic expert would not arise. [See *Nirmal Singh v State of Bihar,* (2005) 9 SCC 725 : 2004 AIR SCW 6717 : AIR 2005 SC 1265].

Section 45 of the Indian Evidence Act, 1872 reads as under:

> *45. Opinions of experts.*—When the Court has to form an opinion upon a point of foreign law or of science or art, or as identity of handwriting or finger impressions, the opinions upon that point of persons specially skilled in such foreign law, science or art, or in questions as to identity of handwriting or finger impressions are relevant facts. Such persons are called experts.

The opinion of an expert, therefore, is a relevant fact. The court may, thus, took the expert opinion into consideration. But appreciation of evidence is the court's job.

It is, thus, for the court to arrive at an opinion as to which part of contradictory expert opinion should be accepted or whether in a given situation ocular evidence should be believed in preference to medical evidence or *vice versa.*

In *State of Uttar Pradesh v Krishna Gopal,* (1988) 4 SCC 302 : AIR 1988 SC 2154 : JT 1988 (3) SC 544, this court has observed:

> It is trite that where the eye-witnesses account is found credible and trustworthy, medical opinion pointing to alternative possibilities is not accepted as conclusive. Witnesses, as Bentham said, are the eyes and ears of justice. Hence the importance and primacy of the orality of the trial process. Eye-witnesses account would require a careful independent assessment and evaluation for their credibility which should not be adversely prejudged making any other evidence, including medical evidence, as the sole touchstone for the test of such credibility. The evidence must be tested for its inherent consistency and the inherent probability of the story; consistency with the account of other witnesses held to be creditworthy; consistency with the undisputed facts; the credit of the witnesses; their performance in the witness box; their power of observation Then the probative value of such evidence becomes eligible to be put into the scales for a cumulative evaluation.

Yet again in *Dhirajbhai Gorakhbhai Nayak v State of Gujarat,* (2003) 9 SCC 322 : AIR 2003 SC 2855 : 2003 Cr LJ 3723, this Court held:

> As regards the alleged discrepancy between the medical evidence and ocular evidence, it is to be noted that a combined reading of the evidence of PW-9 who examined the deceased after he was brought to the hospital and PW-7 who conducted the post-mortem, it is clear that there is no discrepancy in the medical evidence *vis-a-vis* ocular evidence. Only in respect of Injury 1, there appears to be some confusion but that does not dilute the prosecution evidence. It would be erroneous to accord undue primacy to the hypothetical answers of medical witnesses to exclude the eye-witnesses account which has to be tested independently and not treated as variable keeping in view the medical evidence as constant. (See *State of Uttar Pradesh v Krishna Gopal*)

In *Birendra Rai v State of Bihar,* (2005) 9 SCC 719 : AIR 2005 SC 1284 : 2004 AIR SCW 6950, this Court observed:

> We do not attach much significance to the fact that some of the wounds showed an upward trajectory. A bullet may possibly be deflected if it hits a hard surface. The fact remains that all the shots fired have caused wound of entry as well as exit wound, and from the description of the wounds given by the doctor it appears that the firing was done from very close range. The evidence of the witnesses is to the same effect. They have clearly stated that they came near the deceased after firing took place. There was indiscriminate firing at the deceased who fell down after receiving the first injury. One cannot assume that the deceased was lying still in one posture after falling on the ground. He must have been writhing in pain when several shots were fired at him, and in that process several injuries were caused to him. So viewed, we find no inconsistency between the ocular evidence and medical evidence on record.

It was further observed:

> It was submitted that if several shots were fired, some pellets would have been found at the place of occurrence. It is the case of the prosecution that no pellets were found. For this reason alone we cannot discard the case of the prosecution. If pellets were found at the place of occurrence it would have further strengthened the case of the prosecution, but in the absence of such evidence one has to rely upon the ocular evidence which if found reliable, may be acted upon.

In *Nirmal Singh* (supra), it was held:

> Counsel then submitted that the prosecution has failed to prove that the dalan of the deceased was the real place of occurrence. This submission is based on the fact that no bloodstained earth was seized from the place of occurrence. It is true that no bloodstained earth was seized from the place of occurrence but there is also evidence of several witnesses including the investigating officer that no blood had fallen on the earth. Eye-witnesses explained that on receiving the injury the deceased pressed his wound with his hands whereafter a piece of cloth was tied around the wound which soaked the blood which may have come out. There was, therefore, no likelihood of the earth getting bloodstained. Counsel for the appellants submitted that the intestines were protruding as described in the

> inquest report, and in such a situation there must have been some bleeding. That may be so, but in view of the explanation offered by the prosecution witnesses it appears probable that no blood had fallen on the ground at the place of occurrence. In any event, if some blood had fallen at the place of occurrence which the investigating officer failed to notice, that by itself will not be fatal to the case of the prosecution. We must observe that the investigation in this case has been most unsatisfactory and the investigating officer was not conscious of his responsibilities. The bloodstained piece of cloth which was wrapped around the wound of the deceased appears to have been seized by the investigating officer, but when questioned as to why it was not sent for chemical examination, he answered that he had hung that piece of cloth on a guava tree in the police station. The statement is comical but discloses the utter non-seriousness with which the investigation was conducted. We had expected better from the investigating officer who was investigating a serious case of murder. However, for this reason we will not reject the case of the prosecution entirely. [Emphasis supplied]

We, therefore, are of the opinion that the second contention of the learned counsel also cannot be accepted.

We, however, are not oblivious of one patent fact. In the First Information Report, the first informant, attributed the act of firing to Brijnandan Prasad and Sahdeo. PW-4, however, in his deposition before the court attributed the act of firing only to Brijnandan Prasad. According to him, other persons were only wielding rifles. Shivnandan Prasad fell down after receiving the gunshot and died. He in his cross-examination also attributed the act of firing only to Brijnandan Prasad. PW-5 although stated that all the accused had started firing but even according to her Brijnandan Prasad fired shot which had hit the deceased on his chest. Evidence of PW-6 is also to the same effect that the shot which had hit his father on the chest was fired by Brijnandan Prasad. PW-7 and PW-8 also named Brijnandan Prasad.

The prosecution case is that the dispute started on lighting of fire on a heap of straw. The accused allegedly hurled brick bats, which compelled the deceased to come to the roof to forbid them from doing so. Whereas Brijnandan Prasad alone fired a shot which had hit the deceased, there is no evidence brought on record to show that any other accused did so. No gunshot injury was suffered by any person. The deceased has also suffered only one gunshot injury. No sign of firing was found on the walls or any other part of the building. No cartridge was recovered.

Even no other person had suffered any injury by reason of hurling of brick bats. Having regard to the materials brought on records, we are of the opinion that in this case although the prosecution has proved the charge of committing the murder of the deceased, it has failed to establish that the accused had any common intention in relation thereto. Brijnandan Prasad alone was, thus, responsible therefor. Had the other accused shared common intention with Brijnandan Prasad, they would have also fired. No such evidence having been brought on record, the benefit of doubt must be extended to the other accused persons.

8.20.10 Ballistics Evidence Desirable, not Indispensable[29]

Author's Summary

It is a case of unfortunate murder. The bullet from a licensed revolver injured the spinal cord of the victim (extracted at postmortem). In spite of medical care, the female died after about 5 months. The doctor gave Septicemia as the cause of death.

The SC held that the real cause of death was bullet injury and convicted the culprit. SC also mentioned that linkage of the bullet with the firearm was desirable but not indispensable in view of evidence of eyewitnesses

Highlights italicised

29. *Vineet Kumar Chauhan v State of Uttar Pradesh*, AIR 2008 SC 780 : 2008 AIR SCW 1 : 2008 Cr LJ 1367.

Relevant Extracts (Verbatim)

The genesis of the prosecution case, in brief, was that on 13 October 1993 at about 11.50 am, one Sri Krishna Sharma (PW-1), husband of the deceased, lodged an F.I.R. with the police station Majhola, District Moradabad to the effect that on that day, at about 9.45 am, when he along with his wife and children was watching television, the appellant who was living opposite their house and was a cable operator along with his servant Dharamveer, came to their house and tried to persuade his son-Ravindra Sharma (PW-2) to take a cable connection from them. Not being interested in the cable connection, they declined the request of the appellant whereupon an altercation took place between the appellant and PW-2. The complainant and his wife intervened and asked the appellant to leave their house. The appellant went to his house, brought out the licensed revolver of his father and opened indiscriminate firing towards complainant's house from the door of his house. Some bullets hit the door of the house of Sri Krishna Sharma and while his wife, the victim, was closing the door, one of the bullets hit her in the jaw. Sri Krishna Sharma brought his injured wife to the hospital for treatment and thereafter lodged the F.I.R.

3. The victim was examined by Dr. Jagmal Singh, PW-4. The following injuries were found on her person:

1. Lacerated wound 1.5 cm. x .5 cm x not probed on face, left side over left mandible, 3 cm. below and outer to left angle of mouth. Advised x-ray of left side fact and left side neck.
2. Lacerated wound .5 cm x .5 cm x skin on left arm outer part, 4 cm. above left elbow.

4. Both the injuries were found to be fresh. Injury No. 1 was alleged to have been caused by firearm but final opinion was reserved to be given after the x-ray. Injury No. 2 was caused by a blunt object. On x-ray being taken, a radio opaque shadow elongated was found in the thoracic spine in dorsal region over T 5-6.

5. The victim remained under treatment and supervision of Dr. D.S. Ahlawat (PW-5). On 15 October 1993, she was taken to Delhi for treatment. However, on 21 October 1993, she was again admitted in Moradabad Hospital, where she developed bedsores. Smt. Premwati ultimately died on 25 March 1994. As per the autopsy conducted by Dr. S.P. Singh (PW-7) on 25 March 1994, the ante-mortem injuries were mainly deep bedsores on various parts of the body and one old healed scar, size 1.2 cm x .5 cut, on the left face at the chin 2.5 cm. away from medium plank thoracic spine.

> *On internal examination, the doctor recovered a metallic bullet from her spinal cord, which had caused extensive damage in thoracic spine and paralysis in half of the body. The cause of death was opined to be septicemia and toxemia due to bedsores. After investigations, charge-sheet under sections 452 and 307 was filed against the appellant and his father. However, charges were framed against them under sections 302 and 307 IPC.*

8. Mr. Sushil Kumar, learned senior counsel appearing on behalf of the appellant assailed the conviction of the appellant mainly on the ground that apart from the fact that the Ballistic Report casts a serious doubt that the distorted bullet allegedly recovered from the spot came out of the seized revolver, it was also obligatory on the part of the prosecution to send the bullet, allegedly recovered from the body of the deceased, for being examined by the Ballistic Expert, so as to connect the recovered licensed revolver of the appellants father with the crime. It was submitted that since it was a positive case of the prosecution that the bullet which had hit the deceased was fired from the seized revolver, omission to send the bullet for ballistic examination is a serious infirmity in the prosecution case, which assumes still greater significance because of Ballistic Report, which does not even establish that the remnants of the bullet (lead), recovered from the place of incident, was of the bullet fired from the revolver allegedly used by the

appellant. In support, strong reliance is placed on the decision of this Court in *Mohinder Singh v State of Punjab,* AIR 1953 SC 415 : 1953 Cr LJ 1761 (SC) wherein it was observed that in a case where death is due to injuries or wounds caused by a lethal weapon, it has always been considered to be the duty of the prosecution to prove by expert evidence that it was likely or at least possible for the injuries to have been caused with the weapon with which and in the manner in which they are alleged to have been caused. Reference is also made to another decision of this Court in *State of Madhya Pradesh v Surpa*,[30] expressing a similar view. Learned counsel has also contended that all through the case of the prosecution was that the accused was firing towards the house of the deceased without aiming at any person and the bullet hit the deceased accidentally when she was closing the door of the house. It is urged that in case the appellant had any intention to commit the murder of the deceased or any member of her family, he would have gone to their house and shot them. It is argued that even if the occurrence is admitted to have taken place in the manner alleged, the appellant cannot be held guilty for the commission of an offence punishable under section 302 IPC. It is asserted that the occurrence having taken place without pre-meditation, in the heat of the passion upon a sudden quarrel, the appellant is entitled to the benefit of Exception 4 of section 300 IPC.

9. Learned counsel for the State, on the other hand, supported the view taken by the High Court.

10. *It cannot be laid down as a general proposition that in every case where a firearm is allegedly used by an accused person, the prosecution must lead the evidence of a Ballistic Expert to prove the charge, irrespective of the quality of the direct evidence available on record. It needs little emphasis that where direct evidence is of such an unimpeachable character, and the nature of injuries, disclosed by post-mortem notes is consistent with the direct evidence, the examination of Ballistic Expert may not be regarded as essential. However, where direct evidence is not available or that there is some doubt as to whether the injuries could or could not have been caused by a particular weapon, examination of an expert would be desirable to cure an apparent inconsistency or for the purpose of corroboration of oral evidence.* (See: *Gurcharan Singh v State of Punjab*).

11. In *Mohinder Singh's* case (*supra*) on which strong reliance is placed on behalf of the appellant, this Court has held that, where the prosecution case was that the accused shot the deceased with a gun, but it appeared likely that the injuries on the deceased were inflicted by a rifle and there was no evidence of a duly qualified expert to prove that the injuries were caused by a gun, and the nature of the injuries was also such that the shots must have been fired by more than one person and not by one person only, and the prosecution had no evidence to show that another person also shot, and the oral evidence was of witnesses who were not disinterested, the failure to examine an expert would be a serious infirmity in the prosecution case. It is plain that these observations were made in a case where the prosecution evidence was suffering from serious infirmities. Thus, in determining the effect of these observations, the facts in respect of which these observations came to be made cannot be lost sight of. The said case, therefore, cannot be held to lay down an inflexible rule that in every case where an accused person is charged with murder caused by a lethal weapon, the prosecution case can succeed in proving the charge only if Ballistic Expert is examined. In what cases, the examination of a Ballistic Expert is essential for the proof of the prosecution case, must depend upon the facts and circumstances of each case.

12. ***In the instant case, having regard to the ocular evidence adduced by the prosecution, there is no reason to discard the prosecution theory that the injury as a result whereof Smt. Premwati suffered complete paralysis of both the lower limbs, was caused by a bullet fired from a revolver. The nature of the injury as proved by Dr. P.S. Ahlawat (PW-5), under***

30. *Vineet Kumar Chauhan v State of Uttar Pradesh*, AIR 2008 SC 780 : 2008 Cr LJ 1367 (SC).

whose treatment the deceased remained at Moradabad and Dr. S.P. Singh (PW-7), who had conducted the post-mortem examination is wholly consistent with the prosecution version. It is clear that the bullet recovered by PW-7 at the time of post-mortem of the victim had traversed to thoracic spine through the neck from the face near the angle of the jaw, hitting the fifth thoracic vertebra, badly damaging the underlying spinal cord. We are, therefore, of the view that on the facts of the present case, the absence of Ballistic Experts evidence is not fatal to the case of the prosecution, notwithstanding the fact that the Forensic Science Laboratory, in its report dated 18 February 1991, had not expressed a definite opinion about the bullet recovered from the place of occurrence.

13. Insofar as the testimonies of PW-1 and PW-2, the two star witnesses of the prosecution, are concerned, from the impugned judgment, it is manifest that the High Court, on analysis of their statements, has found these to be trustworthy. The High Court has observed that testimony of these two natural witnesses is of sterling character with no holes whatsoever. Based on this evidence, the High Court has found that it was the appellant who had opened fire from the revolver from his door, one of which had hit the victim, who had come to close the main door of her house. Nothing has been shown to us so as to warrant interference with the said finding recorded by the High Court. Therefore, in the context of this unimpeachable evidence, it stands proved that the appellant had gone to the house of the deceased; some unsavoury incident took place there; he returned to his house in a huff; took out the revolver of his father and fired shots towards the house of the deceased; one of the bullets hit the deceased and the same proved to be fatal. Having bestowed our anxious consideration to the evidence on record, in particular the testimony of PW-1 and PW-2, we are of the opinion that the High Court was correct in coming to the conclusion that the appellant was responsible for causing the fatal injury to the deceased. We are also in agreement with the High Court that though as per the post-mortem report the deceased died of septicemia and toxemia because of bedsores, the basic cause of her death was the bullet injury caused to her by the appellant.

8.20.11 Nature of Firearm from Injuries[31]

Author's Summary

It is a case of multi-murders. A party travelling in a car was ambushed. 3 persons died on the spot and others were injured. The culprits ran away after the firing. The question came up what type of weapon(s) were used by the culprits. The SC has used authorities to identify the firearms from injuries.

Highlights italicised

Relevant Extracts (Verbatim)

3. On 4 April 1999 Rakesh Kumar Pandey along with his brother-in-law Surya Narain @ Vakil Shukla along with three others, Devi Shankar Dubey, Prem Shanker Dubey and the car driver Shesh Mani were returning from Aurai to Gopiganj in the latter car No. WB 26A 7554. As the car reached near the Trimuhani on the middle of the road in Gopiganj, accused Udai Bhan Singh, Akbal Bahadur @ Atkoti Singh, Prem Singh, Dhunni Singh, Munni Singh, Daroga Singh, Rajeshwar Upadhyay, Pintoo Singh and two other persons all armed with modern weapons starting firing at the car. The firing led to the death of Surya Narain @ Vakil Shukla, Devi Shanker Dubey and Shesh Mani at the spot. Rakesh Kumar Pandey and

31. *Sarvesh Narain Shukla v Daroga Singh*, AIR 2008 SC 320 : 2007 AIR SCW 6843 : 2008 (1) ALJ 56.

Prem Shanker who were sitting on the rear seat rushed out of the car to save themselves and they too received some superficial injuries in that process. The assailants also picked up the licensed rifle of Prem Shanker Dubey which was lying in the car and thereafter ran away from the Spot. The occurrence was also witnessed by Shiv Prasad @ Dangar Tewari, Mukand Lal, Ram Dutt Mishra and several other persons. An FIR was thereafter lodged by Rakesh Kumar Pandey at 3.45 pm in Police Station Gopiganj a kilometre away from the place of incident on which S.I. Vidya Prakash Misra reached the place of occurrence and recorded the statement of Rakesh Kumar Pandey whereas S.I. Rashid Ahmad prepared the inquest reports of the deceased on the dictation of S.I. Vidya Prakash Misra. On inspection of the site, several pieces of glass, a blood stained piece of rexine, and shoes and some fired cartridges, a rifle and a 9 mm pistol licensed to deceased Surya Narain Shukla were recovered. The bodies were also sent for the post-mortem examinations. The post-mortem examination on the dead body of Devi Shanker Dubey was conducted by Dr. Radhey Raman on 4 April 1999 at about 11.55 pm whereas Dr. Sanjay Tewari conducted the post-mortem examinations on the dead bodies of Shesh Mani at 11.30 pm and that on Surya Narain Shukla 45 minutes later *i.e.,* at 0030 hours. All three dead bodies showed extensive firearms injuries. Dr. A.K. Pandey also medically examined Prem Shanker Dubey at 5.25 pm on 4 April 1999 and found two lacerated simple injuries on his person whereas the examination of Rakesh Kumar Pandey at 8.15 pm on 4 April 1999 by Dr. L.S. Mishra showed five simple injuries; three abrasions and two contusions. The doctors opined that these injuries could have been caused as the two were making a hurried exit from the car. On the completion of the investigation the accused were charged for offences punishable under sections 147, 148, 302 read with 149 I.P.C whereas appellant Suresh Singh @ Jajjey Singh was in addition charged under section 379, IPC for having taking away Prem Shankar Dubey\022s rifle from the car whereas Tehsildar Singh and Suresh Singh were further charged under section 411, I.P.C. The accused pleaded not guilty and sought trial.

* * *

13. Mr. Sushil Kumar has also laid great stress on what he perceives to be an apparent discordance between the ocular and the medical evidence. He has emphasized that the Investigating Officer had picked up three spent cases of a 12 bore shotgun from the spot and a wad had also been recovered from one of the dead bodies at the time of the post-mortem examination thus indicating that only shotguns and no pistols or carbines as alleged had been used, which clearly falsified the eye-witnesses. He has in this connection cited the judgment in *Awadesh v State of Madhya Pradesh,* (1988) 3 SCR 513 : (1988) 2 SCC 557 : AIR 1988 SC 1158 to submit that where medical opinion was at variance with the ocular account the accused were entitled to the resultant benefit.

Undoubtedly, the medical evidence is extremely relevant in testing the credibility of an eye-witness but we are of the opinion that the eye-witness account is fully in consonance with the statements of the doctors and the other medical evidence. It has come in the statement of the eye-witnesses including Prem Shankar Dubey and also of Dr. Sanjay Tewari PW-8 on specific questions put to them that the shots had been fired from a distance of a foot or two. We now reproduce the post-mortem reports prepared by PW Dr. Sanjay Tewari with respect to Vakil Shukla and Shesh Mani Rai:

Vakil Shukla

1. Lacerated wound 2x1 Cm. on the mid forehead with charring and tattooing around it. Frontal bone not injured.
2. Abrasion 1x 0.5 Cm. on the mid forehead with charring and tattooing around it.

3. Wound of firearm entry 6 in number each measuring 0.8 x 0.8 Cm. on the top and back of the left shoulder. Margins of wound inverted with blackening and tattooing all around it with their wound of exit as follows—
   (1) 1.5 x 1.5 Cm. on the left side chest below the left axilla 5 Cm. below the apex;
   (2) 3 x 3 Cm. on the left side chest 8 Cm. below and lateral to the left nipple;
   (3) 1 x 1 Cm. on the right side chest 6 Cm. below the right nipple.
   (4) 1x1 Cm. on the right side chest 4.5 Cm. above and medial to the right nipple;
   (5) 1x1 Cm. on the right side chest 8 Cm. below the right nipple; and
   (6) 1x1 Cm. on the right side chest 6.5 Cm. lateral to the right nipple.
4. Firearm wound of entry 0.8x0.8 Cm. on the lateral surface of right mid-thigh with inverted margins and tattooing all around it with its wound of exit on the medial surface of thigh at the same level with averted margins 1x1 Cm.

Shesh Mani Rai

1. 5 x 4 Cm. on the right side neck 1 cm. below and posterior to the right ear. Margins of the wound were inverted with charring and tattooing of skin all around with its wound of exit of size 6x5 Cm. on the left side face/over and lateral to the left eye-with averted margins;
2. Wound of entrance 5.5x4 Cm. on the right side eye margin of the wound inverted with charring and tattooing of skin all around, with its wound of exit 6x6 Cm. below the left ear. Margin of the wound averted.
3. Wound of entrance 1x1 Cm. on the lateral aspect of left arm. Margins of wound inverted with charring and tattooing of skin all around with its wound of exit 1.5x1.5 Cm. on the posterior lateral aspect of the left arm. Margins of wound Averted [\024].

14. Dr. Radhey Raman PW-3 recorded the following injuries on the dead body of Devi Shankar Dubey:

1. Firearm wound of entry with charring and tattooing of size 2x1 Cm. Lt. Side of the chest just below the middle part of Lt. Clavicle. Lt. Side Clavicle fractured with same wound of exit.
2. Firearm wound of entry with charring and tattooing of six 1x1 Cm. on rt. Supra clavicle region 4 Cm. Medial to top of rt. Shoulder, margins of wound inverted, with its wound of exit 2.5x2.00 Cm. on the lt. Side of chest on its lateral side 5.00 Cm. lateral and just below it. Nipple margin of wound of exist is averted; and
3. Abraded contusion 2x2 Cm. on rt. Side of the forehead[\024.] [A cork (1.5 x 1.2 cm) was also recovered from the dead body.

15. Relying on the above quoted evidence it has been emphasized that there appeared to be no injuries from a rifle or pistol. We however beg to differ. It bears reiteration that shots had been fired from a distance of a feet or two and this opinion is fortified as the entry wounds without exception show signs of charring and tattooing. The dimensions of the entry wounds also show that several different types of weapons have been used. It is clear from the post-mortem examination of Devi Shankar Dubey\022s body (during which a cork had been recovered) that a shotgun had undoubtedly been used in his murder and that the shot had entered *en masse* as is apparent from the size of wound of entry (Injury No. 1).

16. We now come to the reports of the other two deceased. Injury No. 3 on the person of Vakil Shukla is clearly not an injury caused by a shotgun and has been caused by a medium calibre automatic or semi-automatic rifle or pistol. Mr. Sushil Kumar has however submitted that this injury had possibly been caused by a shotgun using buckshot SG/LG cartridges as had a high velocity rifle been used from a close range as suggested, the bullet would have had a blasting effect on the body. We, however, find that this argument is not substantiated on the evidence, that is, available to us. Undoubtedly, this shot too had been fired from a little beyond point blank range and if it had been fired from a shotgun, the shoulder would have been shattered and in any event the entire charge would have entered the body *en masse* making a rat hole wound of entry.

We are fortified in our view by the observations on p 465 of the Fourth Edition of Dr. B.R. Sharma Forensic Science in Criminal Investigation and Trials: 9.10.7.3 Shotgun injuries:

The nature of the injuries caused by the shotgun is greatly altered by the range. Contact or near contact wounds look like explosions. Close range shots up to about three metres give rat holes varying in diameter from about 2 to 6 centimetres. From about 2 metres to 10 metres the projectiles may form a rat hole surrounded by individual pellet holes. Beyond 10 metres most of the shots form separate holes. The buckshots may separate earlier. For example, an L.G. cartridge may give individual injuries for each shot from a range of about 2 metres. The area covered by the pellets vary with the range and the choke characteristics of a gun. Ordinarily, the shotguns projectiles do not form exit holes except when buckshots are used from close ranges.

* * *

17. Modi *Medical Jurisprudence and Toxicology,* Twenty-third Edition at p 722 is to the same effect. We reproduce the relevant passage hereunder:

> *The effects produced by a small shot fired from a shotgun vary according to the distance of the weapon from the body, and choking device. A charge of small shot, fired very close to, or within a few inches, of the body enters in one mass like a single bullet making a large irregular wound with scorched and contused edges, and is followed by the gases of the discharge which greatly lacerate and rupture the deeper tissues. Particles of unburnt powder expelled from the weapon behind the missile are driven to some distance through the wound, and some of them are found embedded in the wound and the surrounding skin, which is also singed and blackened by the flame and smoke of combustion. The exit wound of a close range shot may show greater damage of tissues than the entrance wound, the margins are everted, but there is no evidence of blackening of singeing. At a distance of one to three feet, small shots make a single aperture with irregular and lacerated edges corresponding in size to the bore of the muzzle of the gun, as the shot enter as one mass, but are scattered after entering the wound and cause great damage to the internal tissues. The skin surrounding the wounds is blackened, scorched and tattooed, with unburnt grains of powder. On the other hand, at a distance of six feet, the central aperture is surrounded by separate openings in an area of about two inches in diameter made by a few pellets of the shot, which spread out before reaching the mark. The skin surrounding the aperture may not be blackened or scorched, but is tattooed to some extent. At a distance of 12 feet, the charge of the shot spreads widely and enters the body as individual pellets producing separate openings in an area of five to eight inches in diameter depending on the choke, but without causing blackening, scorching or tattooing of the surrounding skin.*

21. Mr. Sushil Kumar argument with regard to the use of a high velocity rifle and its effect on the body when fired from a close range would undoubtedly merit serious consideration but in the light of the facts on the record, we are unable to concur. It is the case of the prosecution that carbines and 9mm pistols in addition to shotguns had been used during the attack. A carbine,

a high velocity weapon firing automatically or semi-automatically, and 9mm bore pistols are prohibited firearms permitted for use only by the police and armed forces which invariably use hard-nosed bullets in contradistinction to soft nosed ones used in sporting rifles against soft skinned game and which cause immense internal damage on the victim and huge wounds of exit, if any. We find that all six wounds of entry are of 0.8x0.8 cm. and with the exception of one, all exit wounds are also of almost similar dimensions. We are, therefore, of the opinion that injury No. 3 appears to be a wound of entry from a weapon firing hardnosed bullets which had penetrated the body and exited on the other side. We find support for this view from Modi (Supra) (at pp 717-718): [\023] Because of the obvious difference in design and construction, the wounds produced by hunting ammunition are much more devastating than that of the military ammunition. In military ammunition, the bullets are full metal jacketed having a core of steel or lead inside and are thus prevented from deformation (or expansion) when they hit the target. In contrast, a hunting bullet is designed to deform (or expand) in its passage through the body, producing an increase in its presenting area. Thus a hunting bullet, which is partially metal jacketed, but with the lead core exposed at its tip, is referred to as soft-point bullet. Hollow point hunting-bullets are also partially jacketed but have a cavity at the tip of lead core to facilitate expansion on striking the target. The silvertip hunting-bullet in reality is a soft point bullet whose lead core at its tip is protected by a thin jacket of aluminium alloy sheath. Modern steel-jacketed bullets used in army weapons have the shape of an elongated cone and owing to their great velocity usually pass straight and direct through the body without any deflection or deviation, and without causing much damage. The wounds of entry and exit are almost circular and similar in appearance without any bruising or laceration of the surrounding parts\024.

21. The nature of injuries found on the dead body of Shesh Mani Rai are equally significant. It appears from injury Nos. 1 and 2 which are on the neck and head respectively that the shot had furrowed through the body with a huge exit wound. The very dimension of these injuries show the presence of a rat hole type of entry with a larger wound of exit on the other side. Injury No. 3 substantially corresponds with the injuries found on the dead body of Vakil Shukla and reveals that this injury had not been caused with the weapon which caused the other two injuries. The judgment cited by the learned counsel is therefore on its peculiar facts and based on the premise that the evidence in the case was doubtful.

* * *

20. We have also considered the arguments of learned senior counsel on the appeals against acquittal. We are of the opinion that the matter has been considered by the trial court and the High Court in its correct perspective and no interference is called for.

21. We accordingly dismiss all the appeals.

8.20.12 Pellets not Found in Shotgun Fire[32]

Author's Summary

It is a case of murder in a family dispute, a 12 bore shotgun was used. The main point to determine was whether the injured 2 eyewitnesses were really injured or not . The absence of pellets in their injuries nailed the lie. The SC believed that the firing/killing was in self-defence. The SC also laid guideline to identify a self-defence case.

Highlights italicised

32. *Darshan Singh v State of Punjab*, AIR 2010 SC 1212 : 2010 AIR SCW 832 : 2010 Cr LJ 1393.

Relevant Extracts (Verbatim)

Brief facts which are necessary to dispose of this appeal are recapitulated as under:—

The dispute is between very close and intimate family members. Deceased Gurcharan Singh was the brother of Bakhtawar Singh and uncle of Darshan Singh. He was the father of Gurdish Singh, PW-7, the informant. The agriculture fields of both brothers, Gurcharan Singh and Bakhtawar Singh were situated adjoining to each other. According to the prosecution, on 15 July 1991 at about 8 am. Gurdish Singh, PW-7 and his father, Gurcharan Singh were irrigating their aforesaid fields and were also mending its ridges and at that time Gurdev Singh, PW-8 and Ajit Singh were also present there. In the meantime, Darshan Singh and Bakhtawar Singh came there from the side of their fields raising lalkaras and abused the complainant party. Darshan Singh, accused was armed with D.B.B.L. gun and his father Bakhtawar Singh was carrying a Gandasa and they were saying that they would teach a lesson to the complainant party for cutting the ridges.

5. According to the further story of the prosecution, Bakhtawar Singh gave a Gandasa blow causing injuries on the chest of Gurcharan Singh. Gurcharan Singh was also having a Gandasa with him and in order to save himself he also caused injury on the head of Bakhtawar Singh. Thereafter, Darshan Singh fired two shots from his licensed gun which hit Gurcharan Singh in the chest and some of the pellets hit Gurdish Singh PW-7 on his left upper arm and Gurdev Singh, PW-8 on his left thigh. Gurcharan Singh fell down and died at the spot. Gurdish Singh and others retraced their steps in order to save themselves. Both the accused in order to save themselves ran towards their respective houses. The prosecution examined 11 witnesses. Dr. Mukesh Gupta, PW-4 who conducted the post-mortem examination found the following injuries on the dead body of Gurcharan Singh:—

> 1. There were 14 wounds in an area of 20 cm x 18 cm on the left side of the chest above the nipple. One of the wounds which was above the nipple was having inverted margins. A wad was recovered from this wound. This wound was 1 cm x 1 cm. The 9 wounds which measured 0.75 cm x 0.75 cm which were on the chest and shoulder also had inverted margins. Out of these wounds 6 were found to entering chest cavity and 6 pellets were recovered from the chest cavity. The remaining 3 wounds were having everted margins. These were near the axilla and each wound measured 1 cm x 1 cm. One of the 14 wounds which measured 0.75 cm x 1.5 cm was having inverted margins. It was skin deep and was on the shoulder, upper part of humerus and clavicle bones were found to be fractured. 4th and 5th rib of the left side of the chest were also found to be fractured.
>
> 2. There were 7 wounds in an area of 20 cm x 8 cm on the upper part of the chest on its right side above the nipple. Out of these wounds 3 wounds measuring 0.75 cm x 1 cm each was having inverted margins, these were skin deep. 2 wounds were having everted margins having a dimension of 1 x 1 cm each near the axilla. A pellet was recovered from near the axilla. The remaining 2 wounds were near the top of right shoulder measuring 0.75 x 1.5 cm each with inverted margins. These were skin deep.
>
> 3. An incised wound 8 cm x 0.5 cm skin deep on the left side of chest 3 cm above the nipple. It was horizontally placed.

10. Dr. Mukesh Gupta found following injury on the person of Gurdev Singh:—

> *An abrasion measuring 1 cm x 0.5 cm on the front and inner side of left thigh. It was a superficial abrasion reddish in colour, over the junction of upper l/3rd and lower 2/3rd of the thigh. There was damage to the pajama corresponding to the injury."*
>
> ***11.*** *According to the doctor, the injury was simple in nature and was caused within 24 hours.*
>
> *Doctor also found injury on Gurdish Singh to be superficial. The same reads as under:—*

"A very superficial abrasion 1 cm x 0.5 cm on the upper side of left upper arm 12 cm above the elbow. It was reddish in colour.

12. It may be relevant to mention that Dr. M.S. Gill, PW-5, who conducted the medical examination of Bakhtawar Singh found the following injuries on his person:—

1. An incised wound 7 cm x 0.5 cm on the parietal region of the right side of head. It was placed anterior posteriorly. The wound was bone deep and 4 cm above the right pinna, clotted blood was present.

13. According to doctor, this injury was caused by sharp-edged weapon.

* * *

21. The trial court after discussing the entire evidence came to the conclusion that two counter versions of the case have been presented and, in the view of the trial court, the defence version is more probable and nearer to the truth for the following reasons:

(i) The delay in lodging the FIR impels the court to scrutinize the evidence of witnesses regarding the actual occurrence with greater care and caution.

(ii) The crucial point to be decided in this case was that who was the aggressor or which of the parties can have the motive to open the attack?

The trial court held that "if the accused were already cultivating the land as per compromise, then it does not appeal to reason as to why they would feel aggrieved. On the other hand there was a strong motive for Gurcharan Singh to assault the accused person as he has resiled from the compromise."

(iii) The next crucial point according to the trial court was as to where the incident took place? According to the trial court the incident had taken place in the field of the accused.

(iv) According to the trial court, the presence of the prosecution witnesses Gurdev Singh and Gurdish Singh at the time of alleged occurrence is highly doubtful. Dr. Mukesh Gupta stated that the injuries on Gurdev Singh and Gurdish Singh could be caused by friendly hands and can be self-suffered.

(v) No pellet was recovered from the injuries of the prosecution witnesses namely, Gurdev Singh and Gurdish Singh. The possibility of the injuries on their persons having been fabricated at a later stage cannot be ruled out.

The trial court found that, in the instant case, it appeared that the inquest report was prepared first and the FIR was prepared at some later stage because there was no mention about the injuries of Gurdev Singh and Gurdish Singh in the inquest report, whereas this fact is mentioned in the FIR. According to the prosecution case, Gurdish Singh suffered a pellet injury on his left upper arm whereas, Gurdev Singh was hit on his left thigh. This was so mentioned in the FIR. If it was so, this fact would have been mentioned in the inquest report or the Investigating Officer must have prepared their injury statement, but no such injury statement was prepared at the spot nor their medical examination was got done.

In the cross-examination, Om Prakash ASI had admitted that he came to know about the injuries of Gurdish Singh and Gurdev Singh only when they gave their supplementary statements at the bus stand. The finding of the trial court is that the injuries were fabricated with the connivance of the Investigating Officer just in order to make Gurdish Singh and Gurdev Singh stamp witnesses.

(vi) Gurdish Singh PW-7 had admitted that his father Gurcharan Singh was face to face when Bakhtawar Singh gave Gandasa blow from above to downward vertically on the chest of Gurcharan Singh. However, Dr. Mukesh Gupta contradicted him and stated

that injury No. 3 on the person of Gurcharan Singh was skin deep and was horizontally placed and was possible by a fall on a sharp edged weapon.

From this it can safely be concluded that it was not Bakhtawar Singh who gave Gandasa blow to Gurcharan Singh in the manner as suggested by the prosecution. It is most likely that Gurcharan Singh suffered injury No. 3 by a fall on his own Gandasa and this was the reason that the wound was only skin deep.

The story put forth by the prosecution that Gurcharan Singh was cutting weeds of ridges with Gandasa is not believable. Gurdish Singh stated that he was collecting the cut weeds. They were not having any Kassi or Khurpa and it was not possible to cut weeds of ridges with Gandasa.

(vii) The trial court came to a clear conclusion that Bakhtawar Singh was injured at point 'F' as shown in the site plan at the hands of Gurcharan Singh (deceased). Gurcharan Singh after causing that injury forwarded towards Darshan Singh armed with Gandasa and at that point Darshan Singh had no option but to open fire and Gurcharan Singh died of that firearm injury. The trial court came to the definite conclusion that Darshan Singh fired a shot in his right of private defence.

(viii) The trial court after marshalling the entire evidence came to the conclusion that seeing from all angles, the probabilities of the case are much more in favour of the defence than in favour of the prosecution.

The possibility of the injuries having been caused to Gurcharan Singh by Darshan Singh in the exercise of private defence cannot be ruled out. Thus, the prosecution has failed to prove its case against the accused person beyond any reasonable doubt and the benefit has to be given to them.

58. The following principles (for self-defence) emerge on scrutiny of the judgments[33]:

(i) Self-preservation is the basic human instinct and is duly recognized by the criminal jurisprudence of all civilized countries. All free, democratic and civilized countries recognize the right of private defence within certain reasonable limits.

(ii) The right of private defence is available only to one who is suddenly confronted with the necessity of averting an impending danger and not of self-creation.

(iii) A mere reasonable apprehension is enough to put the right of self-defence into operation. In other words, it is not necessary that there should be an actual commission of the offence in order to give rise to the right of private defence. It is enough if the accused apprehended that such an offence is contemplated and it is likely to be committed if the right of private defence is not exercised.

(iv) The right of private defence commences as soon as a reasonable apprehension arises and it is co-terminus with the duration of such apprehension.

(v) It is unrealistic to expect a person under assault to modulate his defence step by step with any arithmetical exactitude.

33. *See* also *Triloki Nath v State of Uttar Pradesh*, AIR 2006 SC 321 : 2005 AIR SCW 5824 : (2005) 13 SCC 323; *State of Madhya Pradesh v Ramesh*, AIR 2005 SC 1186 : 2004 AIR SCW 6663 : (2005) 9 SCC 705; *James Martin v State of Kerala*, (2004) 2 SCC 203; *Kashmiri Lal v State of Punjab*, AIR 1997 SC 393 : 1996 AIR SCW 3772 : (1996) 10 SCC 471; *Bhagwan Swaroop v State of Madhya Pradesh*, AIR 1992 SC 675 : (1992) 2 SCC 406 : 1992 AIR SCW 362; *Jagtar Singh v State of Punjab*, AIR 1993 SC 970 : 1993 AIR SCW 70 : 1993 Cr LJ 306. Many other cases have also been cited in the present Judgment.

(vi) In private defence the force used by the accused ought not to be wholly is proportionate or much greater than necessary for protection of the person or property.

(vii) It is well-settled that even if the accused does not plead self-defence, it is open to considering such a plea if the same arises from the material on record.

(viii) The accused need not prove the existence of the right of private defence beyond reasonable doubt.

(ix) The Indian Penal Code confers the right of private defence only when that unlawful or wrongful act is an offence.

(x) A person who is in imminent and reasonable danger of losing his life or limb may in exercise of self-defence inflict any harm even extending to death on his assailant either when the assault is attempted or directly threatened.

In the instant case after marshalling and scrutinizing the entire prosecution evidence, we are clearly of the view that the trial court's view is not only the possible or plausible view but it is based on the correct analysis and evaluation of the entire evidence on record. Rationally speaking, no other view is legally possible.

65. Consequently, this appeal is allowed and the impugned judgment of the High Court is set aside and the judgment of acquittal of the trial court is restored. The role attributed to the appellant is fully covered by his right of private defence.

8.20.13 Self-inflicted (fake) Injuries (from Range of Fire)[34]

Author's Summary

The culprit in this case owed Rs 5 lakhs to the victim and would not pay. Instead he took the victim in a car to a lonely place and shot him dead.

To save himself he filed an FIR that he was shot. He had two firearm injuries, one on the arm and the second on the calf. Both had close range fire phenomenon (blacking)

There was an eyewitness who stated that he saw the culprit shooting the victim and creating fake injuries. All the courts accepted the version of the eyewitness, identified the injuries on the accused as fake and convicted him for murder.

Highlights italicised

Relevant Extracts (Verbatim)

3. The case of the prosecution in a nutshell before the trial court was as under: Sandeep Singh (who has been referred to hereinafter as "the deceased") was a resident of Village Chhibian Wali. He had lent a sum of Rs 5 lakhs to Gurjinder Singh, the appellant and the said amount was not being returned by Gurjinder Singh (hereinafter referred to as "the accused"). On the night of 9 June 2001, the deceased and the accused, along with Jasbir Singh (PW-4) were going to Village Chhibian Wali in Maruti Car No. PB 4 E 6699 from Muktsar. The deceased was driving the car and the accused was sitting next to him, whereas PW-4 was sitting on the rear seat. Around 10.30 pm, when they were about one kilometre away from Canal Bridge, Ladhuwala, the accused asked the deceased to stop the car as he wanted to ease himself.

34. *Gurjinder Singh v State of Punjab*, (2011) 3 SCC 530.

4. ***When the car stopped, the accused stepped out of the car and went to the back side of the car and thereafter came near the driver's seat with his pistol and fired one shot on the right temple of the deceased and another shot on the neck of the deceased. Upon seeing the said firing, PW-4, raised an alarm and thereupon the accused warned him that he would kill him also if he would not keep quiet and, thereafter, the accused fired on his own left arm and another shot below his own knee of the right leg.***

5. PW-4 was afraid of the incident and thereafter he ran away from the place. He, thereafter, telephoned his sister and his sister's husband but was advised to keep mum to save himself. Thereafter, his sister and her husband, who were aboard came to India and cremated the deceased. Thereafter, PW-4 went to police station along with his sister and her husband and narrated the incident to SHO Harbans Singh (PW-13). An AIR was lodged by him on 1 July 2001 at 5 am whereas the incident had taken place on 9 June 2001.

6. *It may incidentally be noted that before the aforesaid FIR was lodged, the accused had lodged an FIR being FIR No. 118 on 10 June 2001 at Police Station Sadar, Jalalabad.*

8. After the aforesaid FIR was filed, Harbans Singh (PW-13). The SHO went to the place of offence and prepared inquest report, Ext. p 2 and took possession of three empty cartridges and bloodstained handkerchiefs, bloodstained glasses and one empty cartridge below the driver's seat and one bullet of .32 bore weapon. He also recorded statement of PW-4 on 1 July 2001.

9. As per the report of the forensic science laboratory (FSL) Ext. P-51, the cartridges which had been received from the spot of the offence were fired from 7.65 mm pistol and the blood which was found from the pieces of glass was human blood of Group B.

11. Post-mortem of the body of the deceased was conducted by Dr. Rajesh Kumar Sharma (PW-1) on 10 June 2001, and it was found that there was a lacerated punctured wound on the right temporal region and there was a lacerated punctured wound on the right side of the middle of the neck. There was a dark black area around both the wounds. A lacerated un-punctured wound on the left side of his neck and behind the left ear lobe was also found. The fourth injury on the deceased was on the back of the neck at the level of C 6 vertebra and 3 cm away from the middle of the left side of the neck. The cause of death was shock and haemorrhage due to injuries to brain and neck. The injuries were sufficient to cause death in the ordinary course of nature.

12. At the time of trial, the accused denied the allegations levelled against him. It was his case that PW-4 had planned the murder and he had conspired with Harcharan Singh, with whom the accused had animosity. After examining the witnesses and upon perusal of the evidence, the trial court passed on order of conviction dated 3 March 2006.

13. Being aggrieved by the order of conviction, the foretasted appeal was filed before the High Court by the accused which has been dismissed and, thereafter the present appeal has been filed.

24. Possibly PW-4 was afraid as he was threatened by the appellant as stated by him and also because he had seen the offence being committed before him and for that reason he did not dare to go to the police station immediately but he talked to the parents of the deceased on telephone. It has come in evidence that the parents of the deceased asked him to await till their arrival and thereafter he gathered courage to file an FIR only after having discussion with them the parents of the deceased came to his place and gave him necessary courage and strength to tell the truth before the police authorities. Though there was delay in filing of the FIR, the contents of the FIR are not incorrect.

25. *The story put forward by the accused in his FIR does not appear to be correct. On the contrary, we find truth in the FIR filed by PW-4, because the injuries inflicted upon the accused prima facie appear to be self-inflicted. Looking at the nature of bullet injuries suffered by the accused, it is very*

clear that he was shot from a very close range. The said fact can be revealed from the presence of burn injuries, black area around the wound of the bullet. Had it been fired from a distance, the presence of burn injuries or dark marks around the wound would not have been there.

26. *When a weapon is fired from a close range, normally gunpowder which come along with the bullet make dark burn marks around the wound. Both wounds on the accused are having such black marks which would not have been there if, in fact, he has been shot from a distance, as the burnt gunpowder does not go such far from the muzzle of the weapon. Presence of dark burn marks around the wound shows that the bullet injury had been inflicted from a very close distance. Such burn marks would not have been there if in fact he had been running away from the car. Thus, the story put forward by the accused in his FIR about his being short by another person does not appear to be correct.*

27. With regard to the recovery of the pistol, the learned counsel is right that the pistol was recovered from a public place but it was recovered from the place which could not have been easily located by anyone and, therefore, the accused cannot get the benefit which the learned counsel wanted him to get. From the memo of recovery, it is clear that the pistol had been hidden by digging earth under a plant of Sarkanda about half a kilometre away from a bridge of Ladhuwala Uttar. Thus, it is very clear that the pistol had been hidden by digging earth under the plant of Sarkanda about half a kilometre away on the eastern katcha path from the bridge of Ladhuwala Uttar and, therefore, in our opinion, the recovery cannot be said to be from a place which could have been easily accessible to anyone.

28. With regard to recovery memo, the mistake committed in writing the word "witness" or "witnesses" cannot be said to be so material so as to adversely affect the case of the prosecution. In our opinion, such trivial mistakes should not give any benefit of doubt or any sort of benefit to the accused. In fact, the recovery was made in the presence of Ajaib Singh, Assistant Sub-Inspector and Balbir Singh, Head Constable. It is also not correct that the memo of recovery was not produced before the Court.

29. Exhibit P-46, which reveals the fact about the statement made by the accused in relation to pistol incorporates the entire statement made by the accused. Thereafter, the said document itself incorporates the statement made by the accused. Moreover, simply because the recovery was made in the presence of policemen would not adversely affect the prosecution case. A police officer can be a reliable witness if the court finds him to be a truthful person and in that event there is no harm in relying upon his statement. In the circumstances, we do not find anything objectionable if the pistol had been recovered in the presence of policemen.

30. With regard to the ownership of the pistol, it has been established by the prosecution that for a sum of Rs 90,000 the accused has purchased the pistol on 29 May 2001 whereas the offence has been committed on the night of 9 June 2001. Thus, the pistol had already been purchased by the accused. It is also pertinent to note that intimation with regard to the sale of the pistol had also been given by the seller of the pistol Jagtar Singh (PW-9) to the licensing authority and the said fact was established by PW-8 who is working in the Office of the DC, the licensing authority. Moreover, a sum of Rs 90,000 was paid by the accused for the purchase of the pistol which had been used in the offence.

31. Thus, with regard to ownership and possession of the pistol, the prosecution has proved beyond any doubt that the accused was not only the owner of the pistol in question but was also having possession thereof. It is also in evidence that the bullets which had caused injury to the deceased were fired from the said pistol. Mere non-production of a receipt issued by Jagtar Singh (PW-9) would not make the case of the prosecution weak as it has been duly established that the pistol was sold to the accused.

32. From the aforestated discussion and upon perusal of the evidence, we are satisfied that the trial court as well as the High Court while confirming the order of conviction, are not in error and the order of conviction deserves to be confirmed.

Author's Summary

It is a case of murder with a 12 bore shotgun fire. The postmortem doctor recovered 22 pellets from the deceased. The IO erroneously said that a 12 bore cartridge contain only 7-8 pellets. Defence tried to exploit the ignorance.

However the SC nailed the lie by quoting from the author's earlier Edition of this book

Highlights italicised

8.20.14 Number of Projectile in 12 Bore Cartridge[35]

Relevant Extracts (Verbatim)

This appeal by special leave arises out of the following facts.

One Lal Singh had three sons, Hari Singh, Jaswant Singh and Birbal Singh, Brij Pal Singh PW-1, Ved Pal and Gajender Singh are the sons of Birbal Singh whereas Suraj Bhan, Netar Pal and Satbir Singh are the sons of Jaswant Singh and Ram Pal and Ram Saran, the accused are the sons of Hari Singh, Hari Singh predeceased his father Lal Singh whereafter the joint land holding was partitioned by Lal Singh between his sons Jaswant Singh and Birbal Singh and the sons of Hari Singh deceased in equal shares retaining 18 bighas for himself. About 2-3 years prior to the incident Ram Pal Singh staked a claim that the tube-well on the land was his exclusive property on the plea that the electricity connection was in his father's name. Several civil and criminal litigations followed on account of this dispute and certain other matters with the result that the relations between the accused and Birbal Singh degenerated to an all-time low and about two days prior to the occurrence, an altercation had taken place between Birbal Singh and his son Brij Pal Singh on the one side and the accused on the other, relating to the use of the tubewell water. At about 8.30 am on 20 June 1991, Birbal Singh accompanied by his brother Jaswant Singh and his son Brij Pal Singh left the village to go to Muzaffarnagar for purchase of house-hold articles when they were accosted by the two accused, Ram Pal carrying his licensed DBBL .12 bore shotgun, and Ram Saran armed with a country made pistol and the accused fired a shot each in quick succession hitting Birbal Singh killing him instantaneously Jaswant Singh and Brij Pal Singh saved themselves by lying prone on the ground. The incident was also witnessed by several other persons who were passing by amongst them being Harvir Singh PW-2, Tejvir Singh PW-3, Amar Singh and Matroo Singh and on their challenge the assailants ran away, Brij Pal Singh PW-1 thereafter rushed to the village, wrote out a report and then went to police station, Tetawi, six kilometres away from the place of incident in a tractor and handed over the written complaint at 10.30 am leading to the registration of the FIR. SHO Brij Mohan Mishra accompanied by SI Rajinder Singh then reached the place of occurrence whereafter the SI recorded the inquest proceedings relating to the murder. He also picked up a spent cartridge case and wads of a shotgun cartridge and dispatched the dead body for the post-mortem examination. He also conducted a search of the house of Ram Pal and Ram Saran on 21 June 1981 and recovered a DBBL gun and 10 live cartridges licensed to the former therefrom.

35. *Ram Pal v State of Uttar Pradesh*, 2008 AIR SCW 101 : (2007) 14 Scale 394 : 2008 Cr LJ 1395 (SC).

The weapon and the cartridge case were sent to the Forensic Laboratory and its report revealed that the cartridge had been fired from the right barrel of the gun in question. On the completion of the investigation, the accused were charged for offences punishable under sections 302/149, I.P.C; and they pleaded not guilty and claimed trial.

Mr. Mahavir Singh has also seriously challenged the Forensic evidence in this case by arguing that though the spent cartridge case had been picked up from the spot on 20 June 1981 and the gun recovered the next day, both these items had been sent to the laboratory only on 17 September 1981 and as the 22 pellets recovered from the dead body had not been sent to the laboratory there was no justification in holding that the weapon had in fact been used in the murder. In support of his case Mr. Mahabir Singh has relied on *Palia v State of Punjab,* 1997 SCC (Cri) 383 : 1995 AIR SCW 3026 : 1995 Cr LJ 3232; *Baldev Singh v State of Punjab,* (1990) 4 SCC 692 : AIR 1991 SC 31 : 1990 Cr LJ 2604; *Santa Singh v State of Punjab,* AIR 1956 SC 526. He has also urged that as PW-10 Brij Mohan Mishra in his cross-examination had testified that there were about 7-8 small shots in a .12 bore cartridge, the recovery of 22 pellets from the dead body and the note regarding the smell of gun powder from the barrel of the gun, falsified the prosecution story.

We have considered these arguments very carefully. We first note that the facts that the cartridge case had been left by assailants at the spot and that the shots had been fired from a shotgun and a pistol find mention in the FIR. Interestingly also, there is a suggestion by the defence in the cross-examination as to whether the spent cartridge had been found near the dead body or at some distance therefrom. It is also clear from the statement of Ram Pal recorded under section 313, Cr PC that the gun which was licensed to him had been recovered from his house along with 11 cartridges. We have also perused the statement of PW-7 HC Rameshwar Prasad who stated that the weapon and other articles have been sent to the Muzaffarnagar city Malkhana on 2 July 1981 but had been returned to the police station as there was no place for storage and had been returned to the Malkhana on 13 July 1981 awaiting re-transmission to the laboratory. We also note from the statement of PW-9 Randhir Singh a retired constable who was at the relevant time the moharrir of the Malkhana at Muzaffarnagar in the police station that the weapon and cartridge in a sealed condition had been deposited with him on 2 July 1981 and had not been tampered with till their dispatch to the Forensic Science Laboratory.

We have also gone through the statement of Om Prakash Tripathi PW-8, the expert in the Forensic Science Laboratory who had examined the KF 12 bore fired cartridge case and DBBL gun No. 7902082 and had found that the said cartridge had been fired from the right barrel of the gun.

Seizing on the fact that 22 pellets had been recovered from the dead body and that PW-10 SHO Brij Mohan Mishra had deposed that a 12 bore cartridge contained only seven to eight pellets, Mr. Mahabir Singh has submitted that the prosecution story was on the face of it unacceptable. We find absolutely no merit in this plea. It has some in the evidence of PW-8 Om Parkash Tripathi that the cartridge used was of KF make (KF stands for Kirkee Factory). It is therefore, a cartridge manufactured by the Indian Ordnance Factory, at Kirkee, which has, off and on, been manufacturing cartridges of shot sizes BB to 9 only (this information has been reconfirmed from the Secretary, National Rifle Association of India, New Delhi).

A 12 bore shotgun cartridge carries a shot charge of twenty-five to thirty-five grams in weight and varying number of pellets based on several factors such as the length of the cartridge as would be clear from the following chart taken from Forensic Science in Criminal Investigation and Trials by Dr. B.R. Sharma (4th Edn.) at p 416:

Projectile Charge of Cartridges

Number per 28.35 gs.	*No. of Pellets mm.*	*Pellets diameter in gs.*	*Pellet Weight*
LG	*6*	*9.14*	*4.54*
SG	*8*	*8.43*	*3.54*
Special SG	*11*	*7.57*	*2.58*
SSG	*15*	*6.83*	*1.89*
AAA	*35*	*5.16*	*0.81*
BB	*70*	*4.09*	*0.40*
1	*100*	*3.63 (.16")*	*0.28*
2	*120*	*3.41 (.15")*	*0.24*
3	*140*	*3.25*	*0.20*
4	*170*	*3.05 (.13")*	*0.17*
5	*220*	*2.79 (.12")*	*0.13*
6	*270*	*2.59 (.11")*	*0.10*
7	*340*	*2.41 (.10")*	*0.08*
8	*450*	*2.21 (.09")*	*0.06*
9	*580*	*2.03 (.08")*	*0.05*
Dust	*2770*	*1.2192*	*0.0109*

N.B. The equivalent in inches of the pellet size shown in brackets in the third column has been taken from Lyons Medical Jurisprudence and Toxicology, 11th Edn., p 913 and superimposed in the chart.

From the above table it can be concluded that KF manufactured cartridges can contain between 70 (BB) to 580 (9) pellets per cartridge. The 7-8 pellets that have been referred to by PW Brij Mohan Mishra would be pellets of buck shot such as SG/LG which are not manufactured by the Kirkee Factory.

The post-mortem report also shows that there were multiple wounds of entry 1/8th of an inch over the whole of the chest and upper half of abdomen in an area of 14 x 12, which confirms Brij Pal's statement that the two shots had been fired from a distance of about 40 or 50 feet. We are of the opinion that on account of dispersal of the pellets at that range, not all would have struck home. The recovery of 22 pellets therefore fits in with the prosecution story. The argument based on the gun powder smell from the barrel is equally without substance. In *Modi's Medical jurisprudence and Toxicology,* 23rd Edn. (p 723) while dealing with the topic as to *"the time when the weapon was fired"* it has been observed that "it is never possible to ascertain with any scientific accuracy the time when a weapon or cartridge was fired". In this situation, the judgments cited, which are based on their special facts, have no relevance to the facts of the present case.

We are, therefore, of the opinion that no fault can be found with the judgment of the High Court. We accordingly dismiss the appeal.

8.20.15 Ballistics Expert Evidence: Absence not Always Fatal[36]

The genesis of the prosecution case, in brief, was that on 13 October 1993 at about 11.50. a.m., one Sri Krishna Sharma (PW-1), husband of the deceased, lodged an F.I.R, with the Police Station Majhola, District Moradabad to the effect that on that day, at about 9.45 am, when he along with his wife and children was watching television, the appellant who was living opposite their house and was a cable operator along with his servant Dharamveer, came to their house and tried to persuade his son-Ravindra Sharma (PW-2) to take a cable connection from them. Not being interested in the cable connection, they declined the request of the appellant whereupon an altercation took place between the appellant and PW-2. The complainant and his wife intervened and asked the appellant to leave their house. The appellant went to his house, brought out the licensed revolver of his father and opened indiscriminate firing towards complainant's house from the door of his house. Some bullets hit the door of the house of Sri Krishna Sharma and while his wife, the victim, was closing the door, one of the bullets hit her in the jaw. Sri Krishna Sharma brought his injured wife to the hospital for treatment and thereafter lodged the F.I.R.

The victim was examined by Dr. Jagmal Singh, P.W-4. The following injuries were found on her person:

1. Lacerated wound 1.5 cm. x .5 cm x not probed on face, left side over left mandible, 3 cm. below and outer to left angle of mouth. Advised X-ray of left side face and left side neck.
2. Lacerated wound .5 cm x .5 cm x skin on left arm outer Pt 4 cm. above left elbow.

Both the injuries were found to be fresh. Injury No. 1 was alleged to have been caused by firearm but the final opinion was reserved to be given after the X-ray. Injury No. 2 was caused by a blunt object. On X-ray being taken, a radio opaque shadow elongated was found in thoracic spine in dorsal region over T 5-6.

The victim remained under treatment and supervision of Dr. D.S. Ahlawat (PW-5). On 15 October 1993, she was taken to Delhi for treatment. However, on 21 October 1993, she was again admitted in Moradabad Hospital, where she developed bedsores. Smt. Premwati ultimately died on 25 March 1994. As per the autopsy conducted by Dr. S.P. Singh (PW-7) on 25 March 1994, the ante-mortem injuries were mainly deep bedsores on various parts of the body and one old healed scar, size 12 cm x .5 cut, on the left face at the chin 2.5 cm. away from medium plank thoracic spine. On Internal examination, the doctor recovered a metallic bullet from her spinal cord.

Insofar as the testimonies of PW-1 and PW-2, the two star witnesses of the prosecution, are concerned, from the impugned judgment, it is manifest that the High Court, on analysis of their statements, has found these to be trustworthy. The High Court has observed that testimony of these two natural witnesses is of sterling character with no holes whatsoever. Based on this evidence, the High Court has found that it was the appellant who had opened fire from the revolver from his door, one of which had hit the victim, who had come to close the main door of her house. Nothing has been shown to us so as to warrant interference with the said finding recorded by the High Court. Therefore, in the context of this unimpeachable evidence, it stands proved that the appellant had gone to the house of the deceased; some unsavoury incident took place there; he returned to his house in a huff; took out the revolver of his father and fired shots towards the house of the deceased; one of the bullets hit the deceased and the same proved to be fatal. Having bestowed our anxious consideration to

36. *Vineet Kumar Chauhan v State of Uttar Pradesh*, AIR 2008 SC 780 : 2008 AIR SCW 1 (SC) :2008 Cr LJ 1367.

the evidence on record, in particular the testimony of P.W. 1 and P.W. 2, we are of the opinion that the High Court was correct in coming to the conclusion that the appellant was responsible for causing the fatal injury to the deceased. We are also in agreement with the High Court that though as per the post-mortem report the deceased died of septicemia and toxemia because of bedsores.

Reverting to the facts in hand, as noted above, it stands proved that there being a direct causal connection between the hitting of the bullet, fired by the appellant, to the deceased and her death, the death of the deceased was caused by the appellant. However, having regard to the circumstances, briefly enumerated above, particularly the manner in which the appellant fired the shots, in our view, the appellant could not be attributed the *mens rea* requisite for bringing the case under clause (3) of section 300, IPC. Concededly, there was no enmity between the parties and there is no allegation of the prosecution that before the occurrence, the appellant had premeditated the crime of murder. We are inclined to think that having faced some sort of hostile attitude from the family of the deceased over the cable connection, a sudden quarrel took place between the appellant and the son of the deceased, on account of heat of passion, the appellant went home; took out his father's revolver and started firing indiscriminately, and unfortunately one of the bullets hit the deceased on her chin. At the most, it can be said that he had the knowledge that the use of revolver was likely to cause death and, as such, the present case would fall within the third clause of section 299, IPC. Thus, in our opinion, the offence committed by the appellant was only "culpable homicide not amounting to murder". Under these circumstances, we are inclined to bring down the offence from first degree "murder" to "culpable homicide not amounting to murder", punishable under the Second Part of section 304, IPC.

Consequently, we partly allow the appeal; set aside the conviction of the appellant under section 302, IPC and instead convict him under section 304, Part II, IPC. The sentence of rigorous imprisonment for five years would meet the ends of justice.

8.20.16 Ballistics Evidence: Its Mis-appreciation[37]

Author's Summary

It is a case of murder in which the SC reversed the High court's order of conviction mainly on the basis of the Ballistics Expert's report, which de-linked the firearm of the accused and the cartridge case recovered from the crime scene.

Highlights italicised

Relevant Extracts (Verbatim)

Shortly stated the prosecution case was that one Pushu had two sons (i) Bhawan Singh, and (ii) Bhag Chand. Bhawan Singh had no issue and he died leaving behind him his widow Smt. Rukmani Devi. Bhag Chand also died leaving behind him four sons; (i) Shivraj Singh, (ii) Indra Singh, (iii) Rajpal Singh (deceased), and (iv) Puran Singh (accused). All the four brothers (sons of Bhag Chand) were residing in a jungle at a distance of about two kilometres from village Akhori, Patwari Circle Barab, Tehsil Ukhimath, District Chamoli. There were frequent quarrels between accused Puran Singh on the one hand and other three brothers on the other

37. *Puran Singh v State of Uttrakhand,* 2008 AIR SCW 662 : (2008) 3 SCC 795 : 2008 Cr LJ 1058 (SC).

hand in connection with the property owned and possessed by Rukmani Devi. According to the prosecution, Rukmani Devi had gifted her property by a registered gift-deed to accused Puran Singh depriving other three brothers from her share. On 3 August 1979 at about 4 pm, PW-5 Smt. Ramdei, daughter of PW-4 Shivraj Singh who had come to her parental house at village Akhori was grinding paddy with her deaf and dumb mother Smt. Swanri Devi near her house. At that time, accused Puran Singh came towards the cattle shed of Shivraj Singh and started beating she-buffalo of Shivraj Singh. Smt. Ramdei and her mother raised an objection. Accused got enraged and caught the wife of Shivraj Singh by her hair in order to beat her. Shivraj Singh happened to reach there and cautioned the accused. The accused went inside the room, brought his licensed gun and fired a shot towards Shivraj Singh who luckily escaped unhurt. On hearing the noise, other two brothers of Shivraj Singh, PW-2 Indra Singh and Rajpal Singh (deceased), came out to inquire as to what had happened. The accused started showing his anger towards them also. Both of them, therefore, decided to retreat from there. They were, however, chased by the accused who was carrying his gun. PW-2 Indra Singh asked Rajpal Singh (deceased) to run fast so that they may be saved. Rajpal Singh, unfortunately, turned his face backward to see as to how far away was the accused from him. The accused fired and the gun shot hit Rajpal Singh on his face and head. Rajpal Singh fell down on the ground. In the meanwhile, PW-3 Smt. Bardei, wife of Indra Singh and PW-6 Bimala, minor daughter of Rajpal Singh along with other children and family members reached near the place of incident. They could thus see the incident. Indra Singh was threatened by the accused and he went inside his house and got himself saved. Rajpal Singh became unconscious and remained as such till he was declared dead.

Initially, a case was registered against the appellant-accused in the First Information Report (FIR) for an offence punishable under section 307, IPC as also for an offence punishable under sections 25 and 27 of the Arms Act, 1959. After the death of Rajpal Singh, however, the charge was framed for committing an offence punishable under section 302, IPC. The case was committed to the Court of Session, Chamoli. A plea of the accused was recorded wherein he denied to have committed any offence, and claimed to be tried.

In order to establish the case against the accused, the prosecution examined eight witnesses. Out of them four witnesses were eye-witnesses, *viz.,* PW-2 Indra Singh, PW-3 Smt. Bardei, PW-5 Smt. Ramdei and PW-6 Kumari Bimala. It also examined PW-1 Pratap Singh-Pradhan of the village, PW-7 Dr. D.C. Awasthi and PW-8 Mitra Nand-Patwari.

So far as the death of the deceased Rajpal Singh is concerned, there is no dispute that he died homicidal death and it was due to firearm injuries sustained by him. PW-7 Dr. Awasthi, who performed post-mortem, found the following injuries on the body of the deceased:

(1) Firearm injury ½ cm in diameter circular in shape with inverted margins on right side of scalp parietal region, 5 cm above the top of right ear and 10 cm from the outer corner of the right eye with tattooing (impregnated black carbon particles) over an area of 12 cm x 10 cm over the right side of face, forehead and around the wound. It was wound of entry.

(2) Firearm lacerated injury oval shaped 2½ cm x 1 cm with irregular everted margins 2 cm behind injury No. 1. Clotted blood was present around it. It was wound of exit.

(3) Firearm lacerated wound 1 cm x ½ cm irregular in shape, 2 cm below and behind injury No. 2. It was wound of exit.

(4) Firearm lacerated wound 1 cm x three-fourth cm irregular in shape, 2 cm behind injury No. 2. It was wound of exit.

It was, therefore, clearly proved by the prosecution that the death of deceased Rajpal Singh was homicidal in nature and it was because of the gun injuries sustained by him.

The trial court considered the evidence of eye-witnesses and observed that except minor contradictions, there was no inherent improbability in their evidence. He, however, observed that from the evidence of Investigating Officer and the entries made in the Check Register that FIR and the relevant G.D. entries of the registration of the case, were made at a subsequent stage on some other date and not on 3 August 1979. There was thus 'every occasion for consultation and afterthought'. The trial court also observed that the accused stated that Rajpal Singh (deceased) was injured by a shot fired from the gun carried by a co-villager (Bachan Singh) when the deceased had gone for hunting with his brother Indra Singh and Bachan Singh (co-villager). According to the trial court, it might or might not be so but in view of suspicious circumstances, it could not be said that the prosecution had succeeded in establishing the guilt of the accused 'to the hilt and beyond all reasonable doubts'. In that view of the matter, according to the trial court, the accused was entitled to benefit of doubt. Accordingly, the trial court acquitted the accused.

Being aggrieved by the order of acquittal recorded by the Sessions Court, the State preferred an appeal under section 378 of the Code of Criminal Procedure, 1973. It was contended by the State that once the evidence of prosecution witnesses was believed by the Court and it observed that there was no reason to disbelieve the said evidence, the Court ought to have convicted the accused. It was urged that when the trial court did not find a material contradiction or inherent improbability in the prosecution evidence, the Court was wholly wrong in acquitting the accused.

The High Court re-appreciated the evidence of witnesses and held that the order of acquittal recorded by the trial Court was wholly unsustainable and totally unwarranted. Accordingly, the High Court set aside the order of acquittal and convicted the accused-appellant herein for an offence punishable under section 302, IPC and ordered him to undergo rigorous imprisonment for life as observed earlier.

The accused has challenged the order of conviction and sentence recorded by the High Court by filing the present appeal. On 10 April 2006, appeal was admitted and notice was issued on prayer for bail. On 24 November 2006, when the matter was called out, the Court fixed final hearing of the appeal and observed that in view of that order, it was not necessary to deal with bail application. Appeal is accordingly placed before us for final hearing.

We have heard learned counsel for the parties.

The learned counsel for the appellant raised several contentions. In our opinion, however, it is not necessary to deal with all the contentions in view of the fact that the appeal deserves to be allowed on a short ground.

The learned counsel for the appellant urged that from the opinion of the Ballistic Expert, it was clear that the bullet which caused the injury to the deceased was not fired from the gun said to have been used by the appellant, recovered from him and was examined by the Forensic Science Laboratory. If it is so, the prosecution was not successful in bringing home the guilt of the accused and in establishing that it was the gun of the accused which had caused firearm injury to deceased Rajpal Singh which resulted in his death.

The learned counsel for the State, on the other hand, submitted that the point raised by the learned counsel for the accused in this Court was neither raised before the Sessions Court (trial court) nor before the High Court (Appellate Court). No such point, hence, can be permitted to be raised in this Court for the first time in an appeal under Article 136 of the Constitution.

We would have indeed considered the submission of the learned Government Advocate but for the fact that there is sufficient evidence on record to show that what is sought to be contended by the learned counsel for the accused in this Court has substance and sufficient material is already on record in support of such plea.

We have been taken by the learned counsel for the parties to the record of the case. Exhibit Ka. 3 is the Arrest Panchnama dated 4 August 1979 when the accused was apprehended at about 8 am in the morning. In the memo of arrest as also in seizure memo, it was stated that 'no article was recovered from the body of the accused and nothing was seized by the police'. The accused had nothing except wearing clothes. In Daily Diary by Patwari Circle, Barab, Tehsil Okhimath dated 4 August 1979, it was mentioned that the Patwari started to the place of occurrence from village Senagadmari at about 5.30 am on 4 August 1979. At the place of occurrence, he found injured Rajpal Singh in the custody of villagers. The injured was breathing but was unconscious. The patwari tried to inquire about the incident from Rajpal Singh but the latter could not speak. Though treatment was given to the injured, he died. Inquest panchnama was thereafter prepared in the presence of persons who were there. The FIR was registered under section 307, IPC on the basis of the report dated 3 August 1979 by Partap Singh, Pradhan, but Rajpal Singh died and the case was registered under section 302, IPC. It was stated that "as the death of the injured Rajpal Singh was caused due to intentional gun shot by accused Puran Singh S/o Bhag Chand, therefore, the accused Puran Singh is taken into custody and the weapon used in murder *i.e.,* gun 1319/V-1970, Licence No. 697/Mly-74 and two empty cartridge Bore-12 recovered from the accused and sealed it at the spot in presence of witnesses".

Seizure Memo was prepared on the same day which reads thus:

> Today on dated 4 August 1979 in presence of (1) Shri Pratap Singh, Pradhan Village Panchayat Akhori, (2) Shri Bachan Singh S/o Ram Singh, (3) Shri Bhopal Singh S/o Tilak Singh, Village Akhori, Circle-Barab in the case No. 4/79 State through Pratap Singh, Pradhan, Gram Panchayat Akhori versus accused Puran Sineh S/o Bhag Chand, village Akhori under sections 302 IPC and 25/27 Arms Act, the licensed gun of accused called and ammunition was also called. Then the accused Puran Singh handed over to police his single barrel gun, bullet .12 bore No. 1319 V-1970, licence No. 697/ML4/34-V, booklet, two empty cartridges on which KF-12 Special 12 is written made in India by ORDNANCE FACTORIES and it was seized by police. Accused was asked to handover other ammunition. The availability of which accused denied. When the gun was opened it was not loaded with cartridges. The above recovered article was put in separate sack/packet and sealed. The memo was prepared in presence of witness and their signs were taken.

It is thus clear that even according to the prosecution, the weapon used by the accused for commission of crime *i.e.,* causing the death of deceased Rajpal Singh was recovered along with two empty cartridges. The mudamal gun as also empty cartridges were then sent to the Forensic Science Laboratory, Lucknow, which were examined by the Laboratory.

The prosecution witnesses who were cited as eye-witnesses and examined on oath have also stated that the gun used for commission of offence was recovered and the injuries were caused to the deceased by the accused from the said gun. For instance, PW-2-Indra Singh was shown gun (Ext. 1) and it was observed by the trial Court that "on seeing the gun Ex. 1 the witness told that this is that gun from which Puran Singh fired bullet". Similarly, PW-4-Shivraj Singh stated that it was the same gun. In para 6, it is observed; "Witness was shown Ex. Ka-1. He said that from this gun Puran Singh fired."

So far as medical evidence is concerned, PW-7-Dr. Awasthi had to say this:

"In my opinion, the death was due to coma which was as a result of head injury caused by the discharge of some firearm, which was sufficient in the ordinary course to cause death."

PW-8 Mitra Nand, Patwari stated in his substantive evidence, that he went to the house of the accused and arrested him. He further stated that the accused gave him his licensed gun of single barrel .12 Bore (Ex. 1) and two Cartridges (Exts. 6 & 7) which were sealed separately.

The Report of Forensic Science Laboratory dated 28 November 1979 is also on record. It states that the Laboratory received a letter from Chief Judicial Magistrate, Chamoli (Gopeshwar) along with two 12 bore K.F. Special emptied cartridges marked as E.C. 1 & 2 and one piece of gun 12 bore single barrel No. 1321. It was then stated that the examiner fired five shots from the gun which were marked as T.C 1 to T.C. 5, T.C. 1, T.C. 2 and T.C. 5 misfired and rest fired successfully. Regarding E.C. 1 and E.C. 2, it was stated that there had been signs of firing pin. But on E.C. 2, the signs were not specific. Cap of E.C. 1 had sign of breach and E.C. 2 had minor sign of breach. On the basis of the examination, a conclusion was given which is in the form of result which reads as under:

Result:

(A)

i. The cartridge in question E.C. 1 was not fired from the single barrel 12 bore No. 319 marked 1/79 gun.

ii. The cartridge in question E.C. 2 has no comparative feature with shot fired from gun No. 1319 .12 bore marked 1/79.

(B) On the chemical examination of fouling matter from the gun the nitrate was found from the gun so it is concluded that after last shot the gun was not cleaned but on 3-8-79 whether or not shot was fired from gun designative scientific opinion is not a possibility.

It is thus clear that as per Ballistic Expert's opinion, cartridge E.C. 1 was not fired from the single barrel 12 bore No. 1319 said to have been used by the accused. In our opinion, therefore, the appellant accused is entitled to benefit of doubt.

For the foregoing reasons, the appeal deserves to be allowed and is accordingly allowed. The order of conviction and sentence recorded by the High Court is set aside and the appellant is given benefit of doubt and is ordered to be acquitted. Since the appellant is in jail, he is ordered to be released forthwith if his presence is not required in any other case.

The appeal is accordingly allowed.

8.20.17 Air Gun Evidence[38]

Author's Summary

It is a case of murder with an Air gun. The investigation was haphazard with many lacunae. However, all the courts, (Trial, high and Apex) found adequate evidence to convict the accused.

Highlights italicised

Relevant Extracts (Verbatim)

Mr. A.T.M. Sampath, learned senior counsel appearing on behalf of the appellant, urged that the prosecution cannot be said to have proved the guilt of the appellant who was convicted only on the basis of purported circumstantial evidences. The learned counsel contended that the circumstances against the appellant were not such which could be said to have completed all links in the chain inasmuch as the ownership of the air gun was not proved. The pellets which were noticed by the autopsy surgeon in the dead body of Senthil had not been removed nor the recovery of the air gun can be said to have been made in accordance with the law. It was further submitted that the purported extra-judicial confession which was recorded by a person not authorized therefore in view of rule 72 of Criminal Rules of Practice (CRP) in

38. *Sivakumar v State of Tamil Nadu*, AIR 2006 SC 653 : 2005 AIR SCW 6360 : 2006 Cr LJ 536 (SC).

terms whereof a village Magistrate is prohibited from recording the extra-judicial confession or statement whatever made by an accused person after the police investigation has begun.

Mr. Subramonium Prasad, learned counsel appearing on behalf of the respondent, however, supported the judgment contending that the circumstantial evidences against the appellant had been fully proved in view of the fact that:

(i) he was last seen with the deceased;

(ii) his conduct in leaving the place of occurrence and going to the State of Kerala for a few days;

(iii) extra-judicial confession; and

(iv) recovery of air gun at his instance from Pappannan Thottam canal.

The High Court in its judgment relied upon the following circumstances:

(i) Evidence of PW-1 that he saw Senthil along with the appellant/accused-Siva Kumar, PW-7 Ravikumar on 17 September 1995, 11.00 am and that Senthil was last seen alive in the company of the appellant/accused.

(ii) The appellant/accused purchased M.O.I. Air Gun from the shop of PW-8. -Prakash; M.O.I. Air Gun is in working condition and the death was due to Gunshot wound and the opinion evidence of PW-11-17. P. Rajan (PW-9) is the forensic expert. In his evidence, he stated:

… The above gun was with .22 inches or 5.5 m.m. pipe dia and operated by air. I found the gun was in shooting condition while I shot it for test. The speed of the pellet shot from this gun is 400 feet per second. The pellets had not penetrate (sic) one inch thick deal wood plank at the range of 5 feets as per the tests done under the rules specified under Arms Act, 1962. So licence is not necessary to possess such a gun. The office copy of letter received from Judicial Magistrate No. 2 Polachi by Forensic Science Department, Chennai is Exhibit P-7. The test report submitted by me is Exhibit P-8. There is chance to cause death if the human body is shot from very nearer …

Contention of Mr. Sampath is that the air gun was received in two parts, namely, wooden part and iron part separately and, thus, the evidence of PW-9 should not be relied upon. We do not see any reason to accept the said contention because for the purpose of carrying out tests in the forensic laboratory, the iron part of the gun was material.

PW-10 was the head constable. His evidence is not material. Dr. Jothi Arunachalam (PW-11) conducted the post-mortem examination on the body of the deceased. As noticed hereinbefore, Mr. Sampath submitted that the pellets had not been recovered. PW-11 categorically stated that the foreign body seen through X-ray could not be recovered despite great effort made in this regard during post-mortem. He noticed that the penetrating injury was in the vital organ of the chest part.

In view of the aforementioned statement of PW-11, we are of the opinion that non-recovery of the pellets from the body of the deceased during post-mortem examination was not very material so as to discredit the entire prosecution case.

PW-12 is a formal witness who proved some documents. PW-13 is a retired head constable who registered the case. PW-14 is the Inspector of Police Station before whom the appellant was produced by the Village Administrative Officer. He recovered the air gun produced by the appellant which had been kept under the Pappanan Thottam canal at about 6.30 am on 30 September 1995.

The ownership of the air gun was not necessary to be proved. Recovery of the said air gun was made at the instance of the accused in terms of section 27 of the Indian Penal Code. When the possession of the air gun and recovery thereof had been proved, in our opinion, ownership takes a back seat.

8.20.18 Pellets Identification[39]

Author's Summary

It is a landmark SC judgment which appraised the linkage of buckshot with the shotgun in a case of murder and found it creditworthy. It had not been done before. It has important ramification, the most important being that the smooth bore firearm (including improvised firearms) can be linked to the fired ammunition through them.

Highlights italicised

Relevant Extracts (Verbatim)

K.G. BALAKRISHNAN.—Criminal Appeal Nos. 98-102 of 1999 and Criminal Appeal Nos. 109-114 of 1999 are filed by the State of Madhya Pradesh through CBI and the Criminal Appeal Nos. 103-108 of 1999 are filed by the Chhattisgarh Mukti Morcha. All these appeals arise out of the common judgment passed by the High Court of Madhya Pradesh on 26 June 1998. Nine accused persons were tried by the Second Addl. Sessions Judge, Durg, M.P. Accused Nos. 1 to 8 were charged for the offence under section 302 read with section 120B IPC. The 9th accused was charged under section 302 read with section 120B, and in the alternative, section 302 read with section 34 IPC and section 25(1)(A) and section 27 of the Arms Act. The Sessions Judge acquitted A-6 Naveen Shah, A-7 Chandrabaksh Singh and A-8 Baldev Singh Sandhu. A-1 Chandrakant Shah, A-2 Gyan Prakash Mishra, A-3 Avdhesh Rai, A-4 Abhay Kumar Singh, A-5 Moolchand Shah and A-9 Paltan Mallah @ Ravi were convicted by the Sessions Judge for the offence under section 302 read with section 120B. A-9 Paltan Mallah was found guilty of the offence punishable under section 302 IPC and sentenced to capital punishment whereas other accused were sentenced to life imprisonment. The High Court by the impugned Judgment acquitted all the accused of the charges framed against them.

Deceased Shankar Guha Niyogi was a popular, powerful trade union leader in the industrial region of Bhillai, Durg, which was part of the then State of Madhya Pradesh. Deceased Shankar Guha Niyogi had been working for the welfare of the labour demanding living wages, bonus, reinstatement of retrenched workers and he organised the workers of the various industrial units at Bhillai and Durg. The labourers had an organisation by name "CHATTISGARH MUKTI MORCHA" (hereinafter being referred to as CMM") and deceased Niyogi became a leader of this organisation. He was leading the labourers working at Rajaram Mines area which was a main source of raw material iron ore for the Bhillai Steel Plant at Durg. In the year 1989, there was an agitation by the workers of the industrial unit by name ACC, which is a leading cement manufacturer. A settlement was reached at the instance of deceased Niyogi. The workers in other industrial establishments sought the help of deceased Niyogi to solve their problems. In the year 1990, he came to Bhillai and started occupying quarter No. MIG 1/55 of HUDCO. He stayed there with his servant Bahal Ram. The other members of his family continued to stay near Rajhara. Deceased Niyogi set up an office for CMM at MIG-2/273 HUDCO. In the year 1990, there was widespread labour movement against the management of various industrial units such as Simplex, Kedia, B.E.C. B.K, According to the prosecution, the management of these industrial units started opposing the labour movement and there was even physical attack on some of the leaders of CMM. One Uma Shankar Rai, a leader of CMM was fatally assaulted by the agents of the industrialists. Deceased Niyogi apprehended serious threat

39. *State of Madhya Pradesh v Paltan Mallah*, AIR 2005 SC 733 : 2005 AIR SCW 455 : 2005 Cr LJ 918 (SC).

to his life from the industrialists, especially from Simplex and Kedia Group of Industries. He made notes in his diary regarding the apprehension of danger from the management of these industrial units. On 27 September 1991, he had gone to Raipur and there he met one Rajendra Sail, Secretary General of PUCL and reporter N.K. Singh of "India Today". He expressed an apprehension of danger to his life from Kedia and also from A-5 Moolchand Shah and A-l Chandrakant Shah of Simplex Group. On 27 September 1991 at about midnight, he left Raipur for Bhillai and reached his quarter No. MIG- 1/55 of HUDCO and went to bed. His servant Bahal Ram was occupying the neighbouring room. In the night, Bahal Ram heard a noise like bursting of crackers and he rushed to the room of Niyogi and found Niyogi writhing in pain on his bed. The window was found open. Bahal Ram called for help of the neighbour Sripad Mategaonkar. Few workers from the CMM came to the place and it was found that Niyogi had been shot. He was immediately taken to the Sector 9 Hospital of Bhillai. Before reaching the hospital, Niyogi succumbed to the gun shot injuries. Post-mortem examination was conducted by a team of doctors and they opined that death was due to bullet injuries.

Preliminary investigation was carried out by PW-182 Deputy Superintendent of Police Shri M.G. Agarwal. There was agitation by the workers that investigation shall be conducted by the Central Bureau of Investigation and the Government of Madhya Pradesh requested the Union of India seeking help of the Central Bureau of Investigation. As part of police investigation, PW-182 visited the scene of occurrence and got a prepared map of the site and he took steps to see that viscera of the victim was sent for laboratory tests. He took into custody the pellets recovered from the body of Niyogi. He took statements from Bahal Ram, the servant and also from the widow and daughter of deceased. He got prepared photograph Exh. P-180 to P-196. He got report from Serum Science and Chemical Analysis which are marked as Exh. P-430 to P-432. He recorded statements of various other witnesses. Accused A-3 Avdhesh Rai was taken into custody on 13 October 1991. On 1 November 1991, he seized diary of deceased Niyogi and on 9 November 1991 he handed over the investigation to CBI officials.

PW-187 R.S. Dhankad took over the investigation along with PW 192 R.S. Prasad. PW-187 held search of Oswal Industry. He recorded the statements of Zakkiruddin on 21 November 1991. This witness identified the photographs of A-2 Gyan Prakash Mishra and A-3 Abhay Kumar Singh. PW-192 conducted further investigation of the case along with other officers. On 10 November 1991, he seized the window curtains from the house of Niyogi. On 15 November 1991, he conducted searches of the business premises of Jain and Shah and Company, 108 A. Khan Goga Complex and recovered articles under Exh. P-297.

> ***After the arrest of accused Paltan Mallah on 25 August 1993, he got recovered .12 bore country made weapon, 13 live cartridges of 12 bore, a foreign made revolver, 6 live cartridges of .38 bore and a red colour Suzuki Motorcycle. He sent Exhs. P-403 and 404 to Central Forensic Laboratory (CBI), New Delhi. He conducted various other searches and recovered incriminating articles from the other accused. After investigation, final report was filed.***
>
> **On the side of prosecution PW-1 to PW-192 were examined by the trial court.**

The High Court by the impugned judgment acquitted all the accused and that is challenged before us.

Then the most important item of evidence against the accused, Paltan Mallah, is the report of the ballistic expert. PW-192, the Deputy Superintendent of Police of the CBI deposed that after the arrest of the appellant Paltan Mallah on 25 August 1993, he recovered

one .12 bore improvised pistol, 13 live cartridges .12 bore, one foreign made pistol, 6 live cartridges of .38 bore and a motorcycle. The improvised pistol, the foreign made pistol and the cartridges were sent for examination by the ballistic expert to the Central Forensic & Science Laboratory, New Delhi. During the post-mortem of the deceased Shankar Guha Niyogi, three pellets were extricated from his body. These pellets were sent to Forensic Laboratory at Sagar and thereafter they were deposited in the court by PW-192 and these pellets were also later on obtained from the court and sent for examination by the CFSL. PW-159, the ballistic expert conducted detailed laboratory test-fires and microscopic examination and he gave Exh. P-398 report wherein he opined that three lead pellets marked P-1 to P-3 must have been fired from a .12 bore improvised pistol. He deposed that he had prepared the report on the basis of the microscopic examination and he had also taken photographs of the pellets and Exh. P-398 are the work-sheets of the report prepared by him.

The evidence of PW-159 and his report are seriously challenged by the counsel for the respondent accused. He extensively referred to the text books written by foreign ballistic experts such as Burrad, Hatcher and Taylor. It was argued that in the instant case, the weapon was an improvised pistol and the barrel was not grooved and there was absolutely no question of any identifiable marking coming on the pellets to enable the expert to give any opinion whatsoever. Reliance was placed by him on the observations of this Court in Ram Avtar v Ram Dhavi, (1997) 2 SCC 263 : 1996 AIR SCW 4264 : AIR 1997 SC 107 : 1996 All LJ 1908 wherein this Court relied on the opinion of J.S. Hatcher in his text book of Firearms & Investigation to the effect that "unless there were rifling marks in the bullets which were not defaced by the entry in the bodies of the victims, no expert can ordinarily and generally give an opinion. It was also pointed out that in the case of improvised pistol, it was difficult to assume that the ballistic expert could have found identifying marks on the pellets. The evidence given by the ballistic expert was questioned in great detail. He was cross-examined extensively by counsel for all the accused. He deposed in the cross-examination that when these pellets are fired, then they among themselves would press each other inside the barrel [on inside parts] their effect could be on one side of inner side of barrel, they will take special individual mark on them and these marks will be in the form of a line on the pellets and if the barrel is tight then pellets will be more rubbed, and on more parts, lines will come. If barrel is tight then half part of the pellets are pressed and the barrel was nicely tight and the witness himself said that in the test fire which he did on all of the six pellets good marks of barrel had come. He had also stated that he had taken micro-photograph of only one pellet and had compared all pellets but he had not made any separate comparative record or photograph.

It was argued that micro-photographs were not produced and mere observation by the expert—was not sufficient and that he should have produced these photographs. We do not think that there was any such necessity to produce the micro photographs when the expert has given convincing reasons to support his opinion.

This Court in *Ramanathan v State of Tamil Nadu,* (1978) 3 SCC 86 : 1978 Cr LJ 1137 : AIR 1978 SC 1204 para 26 held that the production of such photographs is not necessary and such a plea was rejected. In para 26, it was held as under:

> It is true that there has been considerable difference of opinion amongst investigators regarding the use of photographs in a court for the purpose of illustrating the matching of the markings, and while it may be that microscopic photographs, when taken with due care and in the best of conditions, may enable the evidence to be placed on the record in a visible form, it cannot be denied that a court would not be justified in rejecting the

> opinion of an expert who has examined the markings under the comparison microscope simply for the reason that he has not thought it necessary to take the photographs. It is therefore not possible for us to reject the evidence of Ramiah (PW-23) who has categorically stated that he had compared the land and groove markings on the bullets under a comparison microscope, simply because he did not think it necessary to take the photographs.

In the case of the respondent-accused Paltan Mallah, there is overwhelming evidence to prove his complicity in the crime. The recovery of the improvised pistol at his instance, which is proved to have been used for causing the death of Shankar Guha Niyogi; and the evidence of the ballistic expert coupled with two extra-judicial confessions made to PW-105 made PW-124 support the prosecution case fully. There is also prosecution evidence to the effect that the accused had got accessibility to the weapons and that he was staying at the place of occurrence and doing various jobs. It is also established that accused Paltan Mallah is involved in other offences relating to firearms. Though there is no direct and convincing evidence against other accused, the case against Paltan Mallah is proved beyond reasonable doubt. He was acquitted by the High Court on fanciful reasons. The evidence of extra-judicial confessions was rejected without any valid reasons. The report of the ballistic expert also was not appreciated in the correct perspective by the High Court. In our view, the Division Bench seriously erred in acquitting the respondent-accused Paltan Mallah.

In the result, we reverse the acquittal of the respondent-accused Paltan Mallah. The incident leading to these appeals had taken place as early as 1991. As there is a long lapse of time, we do not think that the sentence of death imposed upon him by the Sessions Court is justified in the circumstances. We set aside the acquittal of respondent-accused Paltan Mallah and find him guilty of the offence punishable under section 302 IPC and sentence him to undergo imprisonment for life.

8.20.19 Firearm Injuries: Proper Post-mortem[40]

Author's Summary

It is an unfortunate case in which utter ignorance/negligence was shown by the doctors in the postmortem examination of the victim. They failed to locate/extract the foreign bodies in the body of the deceased.

The lacunae/negligence/ignorance was over come in a Medical college by simply taking X-rays pictures.

Highlights italicised

Relevant Extracts (Verbatim)

The case of the prosecution is that on 14 March 1997 at about 8.00 pm in village Kudar Bagha, 4 persons including the appellants herein came near the house of the deceased. When the deceased emerged from his Angan and came to the *dalan*, appellant Ranjan Singh exhorted his companion, appellant Nirmal Singh to shoot the deceased, as a result of which appellant Nirmal Singh fired at the deceased and shot him in the abdomen. The case of the prosecution is that apart from the appellants, the other two were also armed, one with a country made pistol and the other with a lathi. Further case of the prosecution is that after the deceased was injured, the members of the family, who are the witnesses, chased them and while retreating

40. *Nirmal Singh v State of Bihar*, AIR 2005 SC 1265 : 2004 AIR SCW 6717 : 2005 Cr LJ 672 (SC).

all the three accused who were armed with improvised pistols, fired at them but no one was injured. The assailants made good their escape. According to the prosecution, the motive for the occurrence was that 3 days before the incident deceased was returning to his house in village Kudar Bagha and while he was passing in front of the house of the appellant Nirmal Singh, the bundle carried by him on his head touched the roof of the house of appellant Nirmal Singh, which caused a slight damage to the tiles of his roof. This gave rise to an altercation and abuses were exchanged between the parties. It was on account of this incident that appellant Nirmal Singh bore a grudge against the deceased and committed the offence as alleged.

The dead body of the deceased was sent for post-mortem examination which was first conducted by Dr. Gupta, PW-13 on 15 March 1997 at 12.00 noon. Dr. Gupta found an incised penetrating wound on the right side of the abdomen of the deceased which according to him had been caused by a sharp cutting weapon.

It appears that the informant was aggrieved by the finding of the doctor PW-13 who conducted the post-mortem examination and complained to the Chief Judicial Magistrate that the post-mortem had not been fairly conducted. On the orders of the Chief Judicial Magistrate, a second post-mortem examination was conducted by a board of 5 doctors which included Dr. Ganesh Mahto, PW-12, the civil surgeon.

The second post-mortem examination was conducted on 17 March 1997 at 5.30 pm. The finding of the medical board was that there was an oval wound on the right lumber of the area of abdomen anteriorly, size about 2" x (1½)" abdominal cavity deep. The margins were eaten away by the maggots. There was no evidence of blackening or tattooing on the abdominal wall around the wound or anywhere else on the body. The internal organs were in the stage of decomposition and partly eaten away by maggots. All the viscera of abdominal and chest cavity were palpated and dissected for the search of metallic foreign body, but despite vigorous search no-metallic foreign body could be found anywhere in the viscera or in the abdominal and chest cavity. The board could not give any definite opinion relating to injury on the body, but it recommended further detailed investigation and for that purpose recommended that the body be sent to the Department of Forensic Medicines and Toxicology, Patna Medical College Hospital, Patna.

Accordingly, the body was sent to the Patna Medical College Hospital and on 20 March 1997 another post-mortem was done by Dr. A.K. Singh, Tutor Department of Forensic Medicines and Toxicology, Patna Medical College Hospital, Patna. In his report he recorded as follows:—

> ***Erosion of the anterior surface of the 5th vertebra was noticed of one-second" diameter. In view of the advise of the medical Board, (C.S. Chapra) for Skiagram X-ray of chest and abdomen, A.P. View was suggested which was done by the Radiology Deptt. of P.M.H.C. Patna by a Portable X-ray machine, in the Mortuary. The report received from the radiology Deptt. P.M.H.C. with two plates bearing No. – PM/365 dt. 20 March 1997 which read as such – chest A.P. – No evidence of radio opaque shadow seen. N.V. Longitudinal foreign body shadow seen in left side Abdomen with pelvis view A.P. A Radio opaque shadow (F.B.) seen in L/5 level, left side, report was signed by Dr. (Mrs.) Aruna Jaiswal, Associate Professor, Dept. of Radiology, P.M.H.C. Patna.***
>
> ***(2) The 5th Lumbar vertebra was opened and examined and a bullet was recovered from the body of the vertebra which was kept in a glass vial properly levelled, sealed and handed over to constable No. 233 Dhaneshwar Yadav, P.S. Garkha with instruction to hand that over to the I.O. immediately.***

8.20.20 SBML v DBML Guns[41]

Author's Summary

Muzzle-loader firearm is a rare species now. It was used in this case for murder. It created a comedy of errors all round:

1. IO failed to get pellets evaluated or produce intelligible sketch of the crime scene.
2. Prosecutor failed to produce Ballistics expert.
   - The trial court inspected the crime scene at wrong time and did not probe the pellets. The first appellate court surpassed all: Misconceived that the single barrel muzzle loader was wrongly used.
   - Did not call the ballistics expert for proving his report and understanding the working of muzzle-loaders
   - Misinterpreted the emergence of injury No 2. Raising of arm(s) is natural reflex action).
   - Failed to give credence to the eyewitness accounts.
   - Made a mountain of non-injuries on the eyewitness. The target of the assailant was the victim, not witnesses.
3. SC misread section 293 of Cr P C. JSO is not covered in Sub-section 4 of Section 293 of Cr P C.
4. In spite of these comedies of error, the SC provided real justice

Highlights italicised

Relevant Extracts (Verbatim)

Briefly stated the facts are as follows:—The accused and the prosecution witnesses are all from the same village Sug Tarkhana, Tehsil Indora, District Kangra. The accused and P.W.-5 Gian Chand were at loggerheads over the dispute of abadi and civil litigation between them was pending. The deceased Uttam Chand was employed as a carpenter at Delhi and had come to village on 5 August 1995 to attend the performance of first death anniversary of his mother. It is stated that on 14 August 1995 at about 10.00 am. Gian Chand-PW-5 had an altercation and quarrel with the accused Mast Ram with regard to the dispute over the abadi and the deceased Uttam Chand said to have intervened and advised both Gian Chand and Mast Ram not to quarrel and wait for the decision of the court in civil litigation. Thereupon, the accused Mast Ram became furious and threatened the deceased Uttam Chand that he would deal with him first of all as he was siding with Gian Chand with whom the accused had the civil dispute over the abadi. It is further stated that at about 10.30 am on the same day, when the deceased Uttam Chand along with his brother Hans Raj PW-1 and Vijay Kumar PW-3 was proceeding towards the fields to get fodder for the cattle and was passing through the passage in front of the house of the accused Mast Ram, the accused with DBML (Double Barrel Muzzle Loaded) gun in his hand challenged Uttam Chand stating that he would be done to death and then fired at Uttam Chand. The deceased Uttam Chand received injuries on his arm, chest and shoulder, fell down on the ground, and became unconscious. Thereafter, the accused ran away

41. *State of Himachal Pradesh v Mast Ram*, AIR 2004 SC 5056 : 2004 AIR SCW 5754 : 2004 Cr LJ 4973.

towards the field with his gun. In the meantime, PW-4 Tarsem Lal also arrived and PWs 1, 3 and 4 together shifted the deceased Uttam Chand to his nearby house where he breathed his last after sometime. The matter was reported to the Pradhan of the village, who advised to lodge a report with the police and the First Information Report was, accordingly, lodged. The accused was arrested on 18 August 1995 by PW-15 and pursuant to a disclosure statement, the DBML gun (Ex. P-11) was recovered from underneath the bushes near his house. Ex. P-11 was sent for examination to the Forensic Science Laboratory and it was found to be in working condition and having been fired. The accused pleaded ignorance in his statement under section 313 but he did not lead any defence evidence. The spot inspection, was however carried out at the request of the accused in his examination under section 313. It appears that the defence of the accused in his examination under section 313 was that from the place where the accused is alleged to have fired at the deceased and the place where the deceased was standing and hit by the gun shot was not within the firing range. This has led to the trial court for a spot inspection. The inspection was carried out by the trial court on 25 February 1996 in the presence of the accused, his counsel and the Public Prosecutor. The trial court conducted a test gunshot fire from the place where the accused was alleged to have fired at the deceased and it was observed that the place where the deceased was standing and hit by the gunshot was within the firing range.

The trial court after considering the evidence and eye-witnesses accounts of PWs. 1, 3, 4 and PW-2 Dr. Sanjay Kumar Mahajan, who conducted the post-mortem examination and the report of the forensic laboratory has recorded findings that the prosecution has established his case beyond all reasonable doubts and convicted the respondent as aforesaid.

The High Court upset the conviction recorded by the trial court,

Firstly, that the DBML gun (Ex. P-11) alleged to have been used in the commission of offence was not used in a test fire at the time of local inspection conducted by the trial Court and instead a test fire was carried out with the help of SBML (Single Barrel Muzzle Loaded) gun belonging to PW-1 Hans Raj. The High Court held that this has materially affected the prosecution story. According to the High Court, the firing range differs from gun to gun and, therefore, the firing test not having been conducted from the Exhibit P-11, the finding of the learned trial court Judge that the deceased has been hit by the gunshot was within the firing range from the verandah of the house of the deceased could not have been relied upon. This finding, in our opinion, is not only fallacious but also perverse. While it is true that generally, the firing range of the gun differs from gun to gun, the opinion of the High Court that firing range of DBML gun and SBML gun differs is based on no expert opinion and the same is based on conjectures and surmises. In the instant case both the guns are of the same categories except the one used in the commission of the crime is Double Barrel and the one used during the test fire was the Single Barrel. Therefore, it cannot be said that the firing range from DBML gun differed from SBML gun or vice-versa.

That apart, the local inspection envisaged under section 310, Cr PC. is for the purpose of properly appreciating the evidence already recorded during the trial. Memorandum of spot inspection recorded by the trial Judge has to be appreciated in conjunction with the evidence already recorded. Any omission and/or commission in the memorandum recorded by the trial, Judge by itself would not constitute material irregularity, which would vitiate the prosecution case. In our view, it is difficult to accept the reasoning recorded by the High Court in this regard.

Secondly, the ground on which the High Court has thrown out the prosecution story is the report of ballistic expert. The report of ballistic expert (Ex. P-X) was signed by one junior scientific officer. According to the High Court, a junior scientific officer

(Ballistic) is not the officer enumerated under sub-section (4) of section 293 of the Code of Criminal Procedure and, therefore, in the absence of his examination such report cannot be read in evidence. This reason of the High Court, in our view, is also fallacious. Firstly, the Forensic Science Laboratory Report (Ex. P-X) has been submitted under the signatures of a junior scientific officer (Ballistic) of the Central Forensic Science Laboratory, Chandigarh. There is no dispute that the report was submitted under the hand of a Government scientific expert. Section 293(1)[42] of the Code of Criminal Procedure enjoins that any document purporting to be a report under the hand of a Government scientific expert under the section, upon any matter, or thing duly submitted to him for examination or analysis and report in the course of any proceeding under the Code, may be used as evidence in any inquiry, trial or other proceeding under the Code. The High Court has completely overlooked the provision of sub-section (1) of section 293 and arrived at a fallacious conclusion that a junior scientific officer is not an officer enumerated under sub-section (4) of section 293. What sub-section (4) of section 293 envisages is that the court to accept the documents issued by any of six officers enumerated therein as valid evidence without examining the author of the documents.

Thirdly, the High Court was of the view that during the course of post-mortem examination conducted by PW-2 Dr. Sanjay Kumar Mahajan, two pellets were recovered-one each from the right and left lung of the deceased, which were handed over to the police. However, the pellets recovered were never sent for examination to a ballistic expert in order to find out if such pellets were fired from the gun (Ex. P-11) or not. According to the High Court, failure of the prosecution to send the pellets for examination by a ballistic expert will draw an inference against the credibility of the prosecution story. This finding, in our view, is utterly perverse. It is not the requirement of law that pellets recovered from the body be sent to ballistic expert to determine as to whether the pellets were fired from the exhibited gun or not. On the contrary, the recovery of pellets from the body clearly establishes the prosecution case that the deceased died of gunshot injuries.

The fourth reason assigned by the High Court in discarding the prosecution story is with regard to the non-explanation of injury No. 2 on the body of the deceased. The injury No. 2 was described as under:—

"A circular area about 1.5 cm diameter in left axilla towards the left arm."

PW-2 Dr. Sanjay Kumar Mahajan during the course of cross-examination stated that the aforesaid injury could not have been caused had the injured Uttam Chand not raised his arm while walking. The High Court was of the view that PW-1 and PW-3 who were accompanying the deceased Uttam Chand at the relevant time had never stated that deceased Uttam Chand had at any point of time raised his arm while walking or on being challenged by the accused, It is the categorical statement of PW-1 Hans Raj and PW-3 Vijay Kumar that while they were accompanying the deceased, the accused had challenged the deceased and thereafter fired at him. It is but quite natural that the deceased when challenged would have reacted by raising his hands either in defence or in accepting the challenge and in the process he would have sustained injury No. 2, as described. The reaction of the deceased in raining his hands, in such circumstances, would be in tune and in consonance with the natural human behaviour in ordinary circumstances. There is no set of rule that one must react in a particular way. The natural reaction of man is unpredictable. Every one reacts in his own way. Such natural human behaviour is difficult to be proved by credible evidence. It has to be appreciated in the context of given facts and circumstances of each case.

42. The sub-section 4 has specified to which the section 293 is applicable. JSO is not included in it.

Fifthly, the High Court was also of the view that PW-1 Hans Raj and PW-3 Vijay Kumar were accompanying the deceased and the prosecution story shows that the pellets from the gun shot had scattered and hit even the tree but the absence of injuries on the person of PW-1 and PW-3 render their presence at the place of occurrence doubtful. This finding of the High Court in our opinion, is also fallacious and perverse, PW-1 and PW-3 had categorically stated that the deceased was walking ahead of them. The accused undisputedly nurtured a grudge against the deceased for alleged siding with the PW-5 Gian Chand, with whom the accused had civil dispute, challenged the deceased, the gun was aimed at and fired at him. It is, in these circumstances, the absence of pellet injuries on the persons of PW-1 and PW-3 will be no ground to render the presence of PW-1 and PW-3 at the place of occurrence doubtful.

The last and the most perverse and fallacious finding of the High Court is with regard to discarding the evidence of eye-witnesses account of PW-1 Hans Raj and PW-3 Vijay Kumar.

The High Court recorded the finding as under:

> PW-1 Hans Raj is the real brother of the deceased, while PW-3, Vijay Kumar, apart from being a cousin brother of the deceased is the son of PW-5, Gian Chand, with whom admittedly the accused had litigation, it is the prosecution own case that the accused was nursing a grudge against the deceased and PW-1, since they were helping and siding with PW-5, Gian Chand. Both PW-1 and PW-3 are, therefore, interested witnesses and in view of the evidence coming on the record, cannot be safely relied upon.

As already noticed PW-1 Hans Raj and PW-3 Vijay Kumar are two eyewitnesses who accompanied the deceased on the fateful day. Both the eye-witnesses had stated categorically that they accompanied the deceased while going to the fields to fetch fodder for the cattle. When they were passing through the passage in front of the house of the accused, the accused challenged the deceased and in the meantime fired at him, with the result deceased Uttam Chand fell down on the ground after having sustained gunshot injuries on his person. The two eye-witnesses were subjected to lengthy cross-examination but nothing could be elicited to doubt the creditworthiness of their testimony. No doubt; that PW-1 and PW-3 are relatives but this will be no ground to disbelieve their testimony, if otherwise, inspired confidence.

The law on the point is well-settled that the testimony of relative witness cannot be disbelieved on the ground of relationship. The only requirement is to examine their testimony with caution. In the given facts of the case, it is but quite natural that the relatives would have accompanied the deceased to collect the fodder for the cattle from the fields at about 10.30 am on the fateful day. It is also in the prosecution evidence that the incident at 10.30 am is preceded by an altercation and quarrel between the accused Mast Ram and PW-5 Gian Chand, on the same morning at about 10.00 am with regard to the disputed abadi and the deceased Uttam Chand is said to have intervened in the matter and advised both PW-5 Gian Chand and the accused Mast Ram not to quarrel and wait for the decision of the civil litigation. It is also in the evidence that thereupon the accused Mast Ram threatened the deceased Uttam Chand that he would deal with him first of all as he was siding with Gian Chand with whom the accused is having pending litigation with regard to abadi. The categorical testimony of eye-witnesses account has not been considered and discussed at all by the High Court. Their testimony was thrown out at the threshold on the ground of animosity and relationship. This is not the requirement of the Law. That apart PW-4. Tarsem Lal is an independent eye-witness. PW-4 also hails from the same village. He is neither related to the complainant party nor to the accused party. He has stated that he saw the accused Mast Ram in his verandah with a gun in his hand and also saw him running away from the spot after the gunfire. The High Court has not considered and discussed the testimony of PW-4 at all.

The testimony of PWs, 1, 3 and 4 was consistent with the report of ballistic expert and the evidence of PW-2 Dr. Sanjay Kumar Mahajan who conducted the post-mortem examination on the body of the deceased and found the following injuries:—

1. A circular area about 1 cm diameter on Antero-lateral surface of left arm about 9 inches from Acromion.
2. A circular area about 1.5 cm diameter in left Axilla toward left arm.
3. A circular area about 1 cm diameter on Anterior surface of left shoulder,
4. An area circular about 1.2 cm diameter about 3 cm below injury No. 3.
5. A circular area of 1.3 cm diameter on medial wall of left axilla which is formed by chest wall. Tract has been formed on Probing:-3 inches of probe went inside,
6. A circular area of about 1.4 cm diameter in left Infra clavicular region 7 cm below mid clavicular point.
7. A circular area 1.2 cm diameter about 2.3 cm below injury No. 6.
8. An area 2 cm x 1 cm about 2 cm away from left nipple mediosuperior.
9. An area of 3.2 cm x 2.3 cm on sternum about 5 cm below sternal notch.
10. An area of 4.1 cm x 2.3 cm above left costal margin about 5 cm away from Xiphi-Sternum.
11. A circular area of 1 cm diameter on right side of sternum.
12. An area of 7.2 cm x 2.1 cm on right side of chest in Midline about 10 cms below mid clavicular point, widest in centre, tapering on periphery.
13. An area of 6.5 cm x 3.1 cm about 13 cm from medial end of eight clavicle.
14. An area of 15 cms diameter just below right nipple:

On probing; No. 13 it came out of injury No. 14 though subcutaneous planner."

PW-2 Dr. Sanjay Kumar Mahajan, opined that all the injuries were ante-mortem having been sustained by a firearm like gun and such injuries were sufficient in the ordinary course of nature to cause death.

In our view, the consistent ocular testimony of PWs 1, 3 and 4 corroborated by the opinion of PW-2 Dr. Sanjay Kumar Mahajan and ballistic expert report clearly established the prosecution case beyond all reasonable doubts and the High Court fell into grave error of law and facts, resulting in grave miscarriage of justice.

For the foregoing reasons, the order of the High Court is set aside and the order of the trial court is restored. The appeal is allowed. The bail bond of the respondent-accused Mast Ram is cancelled. He is directed to be taken back into custody forthwith. Compliance report within one month from today.

8.21 CASE LAW

8.21.1 Conviction on Firearm Evidence Alone[43]

Author's Note

It is a landmark judgment on Forensic Ballistics. In this case of murder the SC ruled that conviction of a murderer can be based upon ballistics expert's opinion alone. They have cited numerous authorities to support the view.

Highlights italicised

43. *Kalua v State of Uttar Pradesh*, AIR 1958 SC 180 : (1957) SCR 187 : 1958 Cr LJ 300 (SC).
Also see *Meera Puri v State of Nagaland*, 1971 Cr LJ 539 : 1971 Assam LR 22 (Ass and Nag).

While the sessions judge believed the testimony of the eyewitnesses, the learned judges of the High Court were of the opinion that they were unable to accept the assertion of the eye-witnesses that they actually saw the appellant with a pistol by the bed-side of the deceased. The High Court, however, relied upon the circumstantial evidence in the case in upholding the conviction of the appellant. There was a motive for the crime and a few days before the killing of Daya Ram, the appellant had held out a threat against him. The appellant was arrested fourteen miles away from his village which is the place of occurrence. He produced a pistol (Ex. III) from his house in circumstances which clearly showed that he only could have known of its existence there. The opinion of the firearms expert clearly established that the cartridge (Ex. I), found near the cot of Daya Ram, was fired with the pistol (Ex. III) produced by the appellant. All these circumstances, in the opinion of the High Court left no doubt that the appellant murdered Daya Ram by shooting him with his pistol.

It was next urged on behalf of the appellant, that it was impossible for a cartridge to have been near the cot of Daya Ram, because after the shot had been fired the cartridge would still remain in the barrel of the firearm. This again is pure speculation. That the cartridge was ejected from the firearm is certain. Why it was ejected, none can say. It may be that the miscreant reloaded his weapon to meet any emergency. The evidence of the sub-inspector is clear that on his arrival at the place of occurrence the cartridge Ex. 1 was handed over to him by the witness Khamani who cannot be said to be unfavourable to the appellant. The courts below had no reason to disbelieve the evidence in the case that the cartridge Ex. 1 was found near the cot of Daya Ram and we can find no extraordinary circumstance to justify as saying that the courts below took an erroneous view of the evidence.

> ***The real question is, whether it is safe to act upon the opinion of the firearms expert that the cartridge Ex. 1 was fired from the pistol Ex. III produced by the appellant and none other, because without that evidence the circumstantial evidence in the case would be insufficient to convict the appellant of the crime of murder. The opinion of the firearms expert, based on the result of his tests, does not seem to have been challenged in cross-examination or before the High Court. If there is no reason to think that there is any room for error in matters of this kind and it is safe to accept the opinion of the expert, then clearly it is established that the cartridge Ex. 1, found near the cot of Daya Ram, was fired from the pistol Ex. III produced by the appellant.***

To satisfy ourselves we have looked into the works of some authors dealing with the marks left on cartridge and shell cases by firearms in order to ascertain that there is no error in the opinion of the firearms expert in the present case. Kirk in his book *Crime Investigation* at p 346 states:

> ***Fired cases are less often encountered in criminal investigation than are bullets, but when found they are usually of greater significance because they receive at least as clear markings as do bullets, have a greater variety of such markings, and are not ordinarily damaged in firing …***
>
> ***The questions which may be asked as a result of finding such materials are similar to those that require answers when only bullets are located. In the ordinary case, quite definite answers can be given. This is true both of shotgun shells and of cartridge cases from pistols, revolvers, and rifles … In general, it is possible to identify a certain firearm as having fired a particular shell or cartridge, it is often possible to identify the type of make of gun which fired it, though in many instances this must be tentative or probable identification only.***

After dealing with the marks left by breech-block, firing pin impressions, marks from extractors and ejectors, marks due to expansion, magazine marks and loading mechanism marks, he states:

> ***Summarising, the cartridge or shell case usually carries markings which are quite distinctive of the gun in which the charge is fired, and can be used for positive identification of the latter. These marks arise from a variety of contacts with various parts of the gun, an analysis of which is useful in determining the type of weapon in case no suspected gun is available … Thus, the recovered shell or cartridge case is one of the most useful types of physical evidence which can be found in shooting cases.***

Soderman and O'Connell in their book *Modern Criminal Investigation* also deal with the subject and they refer to the marks from the firing pin, the extractor, the ejector, and the breech block. After referring to comparison being made of the cartridge or shell fired from a firearm for the purpose of test, they state at p 200:

> *If they are in the same position in relation to one another and their general appearance is the same, one may conclude that they have been fired from a pistol of the same make. An absolute conclusion about the origin of the shells, however, can be reached only after a photomicrographic examination of the markings from the breech block on the rear of the shell …*
>
> *Identification, with the aid of the enlargement, should not prove difficult. The characteristic scratch can be easily seen. A photograph of the incriminating shell and one of a comparison shell should be pasted side by side on cardboard, and the characteristic marks should be recorded with lines and ciphers, following the same method as that used in the identification of fingerprints.*

In Taylor's book on *Medical Jurisprudence*, 10th Edn., Vol 1, at p 459, it is stated:

> *It is never safe to say that a cartridge case was not fired from a given pistol unless the marks are quite different, and a case which bears no marks at all may quite well have been fired from the same pistol as one which leaves well-defined marks. In general, however, though it is unlikely that all marks will be equally good, it is usually possible to obtain definite information from the marks of the firing pin, extractor, ejector or breech-block on the base or rim or from grooves or scratches on the surface. In weapons of the same manufacture the marks are of the same general nature, but in each weapon there are individual differences which usually enable it to be definitely identified.*

The expert's evidence in this case shows that he had fired test cartridges from the pistol Ex. III. He found the individual characteristics of the chamber to have been impressed upon the test cartridge Exs. 9 and 10 and that exactly identical markings were present on the paper tube of the cartridge Ex. 1. He made photomicrographs of some of these individual marks on Exs. 1 and 10. In giving his reasons for his opinion, the firearms expert stated that every firearm has individual characteristics on its breech face, striking pin and chamber. When a cartridge is fired, gases are generated by the combustion of the powder, creating a pressure of 2 to 20 tons per square inch. Under the effect of this pressure the cap and the paper tube of the cartridge cling firmly with the breech face, striking pin and chamber and being of a softer matter the individualities of these parts are impressed upon them. By firing a number of test cartridge from a given firearm and comparing them under a microscope with the evidence cartridge, it can definitely be stated, if the marks are clear, whether the evidence cartridges had been fired or not from that firearm. It seems to us that the firearm expert made the necessary tests and was careful in what he did. There is no good reason for distrusting his opinion. The learned judges of the High Court examined the photomicrographs in question and were satisfied that there was no ground for distrusting the evidence of the expert. They were accordingly justified in coming to the conclusion that the cartridge Ex. 1, found near the cot of Daya Ram, was fired from the pistol Ex. III produced by the appellant from his house. There can, therefore, be no room for thinking, in the circumstances established in this case, that anyone else other than the appellant might have shot Daya Ram. He was, therefore, rightly convicted for the offence of murder.

The appeal is accordingly dismissed.

8.21.2 Inconclusive Evidence not Fatal[44]

The ballistic expert could not connect the two pieces of the bullet with the rifle but nonetheless he opined that a shot was fired from this rifle and the weapon was a fit one and could be utilized for firing. In these circumstances the inability of the expert to connect the two fragments of the bullet with the rifle could not be a circumstance necessarily leading to the inference that the said bullet was not shot from the rifle. Any expert may be ballistic or otherwise, can only give an opinion evidence. In a case where eye-witnesses are reliable and testify definitely to the weapon of attack any opinion of an expert even if it indicates a circumstance which does not exactly fit in prosecution story would be of no avail and can easily be ignored. [45]All the same in the instant case, the opinion of the expert cannot be stated to negative the prosecution version in any manner.

8.21.3 Unsatisfactory Report[46]

An expert opinion in firearm identification case should produce facts and not opinion which cannot be checked. Being the head of the Forensic Science Laboratory, the expert should know his responsibility towards the administration of criminal justice. He should give up the habit of producing his bald opinion. The expert should, if he expects his opinion to be accepted, put before the court all the material which induced him to come to his conclusion so that the court, although not an expert may form its own judgment on these materials. Bald opinions are of no use to the court and often lead to the breaking of very important links of prosecution evidence which are led for the purpose of corroboration.

The opinion given by Sri Prem Singh, Ballistic Expert, is bald and there is no data or reasons to arrive at the conclusion that the hole already there on the trousers of the injured could be caused by the pellet extracted from the calf of the injured. There is no opinion that the pellet extracted from the calf of the injured could be fired from the gun, Ex. 3, belonging to the appellant, nor could it be possible for the expert to give such an opinion because the gun was a muzzle-loading gun. The size of the shot recovered from the calf of the injured is . 5075". There is no evidence of the size of the shots that were fired by the expert. The shot extracted from the calf of the injured was admittedly not fired by the expert in the test firing. Thus his opinion that the hole found on the trousers of the injured could be caused by the pellet extracted from the leg of the injured cannot be accepted. This opinion cannot be called as an expert's opinion so as to corroborate the ocular evidence on record.

If the opinions of the Doctor and of the Ballistic Expert are ignored then the only evidence left is of the injured himself and of the two witnesses namely Tara Dutt Bhat (P.W. 2) and Pani Ram (P.W. 3). As has been stated above Tara Dutt Bhatt (P.W.2) is admittedly the uncle of the injured. He claims to have gone along with the injured to see she-buffalo at a nearby place and while returning this occurrence took place. But these facts are wanting in the FIR. Similarly, P.W. 3 Pani Ram has stated that the appellant was abusing him and assaulting him on the main road. The injured Hari Charan Bhatt and the witnesses Tara Dutt Bhatt who were returning after seeing she-buffalo saw this occurrence and accosted the appellant that he had become old enough to come out on the road and hurl abuses. These facts are also wanting in the FIR. These facts appear to have been introduced in the evidence simply to make the presence of Tara Dutt Bhatt and Pani Ram probable at the time of occurrence. A suggestion has also been given to Pani Ram that he was 'Halwaha' of the injured. In these circumstances the oral testimony does not repose much confidence.

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44. *State of Himachal Pradesh v Ram Singh*, 1973 Cr LJ 150 (Simla).
45. *Jai Dev and Hari Singh v State of Punjab*, AIR 1963 SC 612 : (1963) 3 SCR 489 : (1963) 1 Cr LJ 495 (SC).
46. *Gopal Singh Gorkha v State of Uttar Pradesh*, 1991 All LJ 374 : 1991 (48) All Cri C 41 : 1991 Cr LJ 1235 (HC).

It is also noteworthy that if the prosecution version is correct, the quarrel was going on between the appellant and Pani Ram. There was no occasion for the injured Hari Chand Bhatt to intervene and to pass any remarks against the appellant. This also makes the prosecution story highly unbelievable.

Thus, a close scrutiny and analysis of the entire prosecution evidence show that some facts which were wanting in the FIR were introduced in the evidence in order to make the presence of Tara Dutt Bhatt (P.W. 2) and Pani Ram (P.W. 3) more probable. The occurrence took place in the evening on road when admittedly a large number of persons were present but none of them was examined. A great suspicion arises from the cuttings and over-writings in the injury report and Bed Head Ticket and also from the discrepancy in paras 4 and 5 of the Expert's report, Ex. Ka-2. Opinion of Ballistic Expert cannot be said to be an expert opinion and has to be discarded outright. Enemity between the injured and the appellant is admitted. In these circumstances, the possibility of false implication of the accused cannot be ruled out.

Before parting with the case it may also be pointed out that the muzzle of the gun when it was recovered from the appellant was found full of rust which was indicative of the fact that it was not used at all since long. P.W. 6 Prem Singh, the Expert, did not make any chemical analysis of the ingredients found on the walls of the muzzle of the gun. He has vaguely denied that what was found on the walls of the muzzle was rust. It is significant to note that he has stated that the residuary remains on the walls of the muzzle after the firing of test shots on analysis were found to contain lead and nitrate. This is highly misleading. Analysis of such remains after firing of test shots was not needed. It is clear that the contents found on the walls of the muzzle before firing of the test shots were not examined and so it cannot be said whether it was rust or traces of ammunition. Probability that the muzzle of the gun was full of rust at the time when it was recovered from the appellant cannot, therefore, be completely ruled out. That negatives the prosecution case that it was from the gun of the appellant that the shot in question was fired.

It has come in evidence that only one shot was fired. No pellets were found around the place of occurrence. Only one pellet entered the calf of the injured. It also seems highly improbable that the appellant would have chosen such an occasion to hit the injured when by his side in close proximity 3 or 4 other persons were also sitting.

In view of the above discussion, the prosecution has not successfully proved its case against the appellant and so the conviction of the appellant on the evidence on record cannot be sustained. The appeal must, therefore, be allowed.

8.21.4 Ballistic Expert's Vacillating Report[47]

It is well-settled law that evidence of witnesses to the occurrence cannot be thrown overboard merely because they are interested and partisan witnesses. All that the law demands is that their evidence should be scrutinised with great care and caution to safeguard against the normal temptation to falsely implicate others. The trial court had adopted that approach in evaluating the evidence of the eyewitnesses. On a critical examination of their evidence it concluded that their evidence stood corroborated by medical evidence, in that, it disclosed that Ali Mohammad had received as many as 18 injuries (13 incised wounds, 2 gunshot wounds, 2 abrasions and one contusion) whereas the deceased Siraju had sustained five injuries (four incised wounds and a swelling). The evidence of P.W. 1 also stood corroborated by the evidence of P.W. 6 Zafaruddin who wrote the FIR Ex. Ka. 3 at the behest of P.W. 1. The contents of the FIR also corroborate the testimony of P.W. 1. The find of blood, from the scene of occurrence

47. *Anvaruddin v Shakoor,* AIR 1990 SC 1242 : (1990) 3 SCC 266 : 1990 Cr LJ 1269 (SC).

noted in the *Panchnama* proved through P.W. 7. Om Prakash also lends corroboration to their testimony. It was, therefore, contended that the High Court failed to come to grips with the evidence and approached the matter in a perfunctory manner.

The deceased Ali Mohammad had, as stated earlier, suffered as many as 18 injuries. Injuries Nos. 12 and 13 are described as gunshot injuries. They read as under:

Injury No. 12:—4 circular gunshot wounds of entry three-fourth cm x three-fourth cm with abraded margins on top of nose and right side of cheek near nose in an area of 5 cm. x 5cm. No tattooing or blackening.

Injury No. 13:—One circular gun shot through and through wound of entry x exist wound three-fourth cm x three-fourth cm on right side upper lip. No tattooing or blackening.

These two injuries are undoubtedly gun-shot injuries. Dr. Mathur, who performed the post-mortem, states that these injuries could be caused if fired at from a distance of over 4 feet. There were corresponding holes in the shirt worn by the victim. The Medico-legal expert does not say that the aforesaid two injuries were possible by a single shot. However, Shri Badul Rai, the ballistic expert, opined that the said two injuries could have been caused by a single shot fired from an improvised pistol. He deposed that if the shots were fired from a short distance of 8 to 10 feet all the pellets would have entered the body *en masse* and would have caused an exit wound thereby discrediting the evidence of the three witnesses that the shots were fired from 2½ to 3 yards. The witness, however, admitted that his estimate regarding the distance from which the shot was fired was based on standard ammunition and not improvised weapons. But when cross-examined he stated that the single shot must have been fired from a country made weapon from a distance of eight feet. The fact that there was no tattooing or blackening is indicative of the fact that the shots were fired from not too short a distance. The High Court took no notice of Dr. Mathur's opinion on this behalf. The evidence of the three eye-witnesses as to the distance from which the shots were fired is a mere estimate. Even though the ballistic expert initially opined that injuries Nos. 12 and 13 could be the result of a single shot he vacillated and stated that the possibility of the said two injuries having been caused by two different shots could not be ruled out altogether. He merely stated that the greater probability was that they were the result of a single shot. In other words, the ballistic expert was not positive in his view. In this nebulous state of the evidence of the ballistic expert we are of the view that the High Court was wholly wrong in doubting the direct evidence of the three eyewitnesses on this ground. Where the expert evidence is obscure and oscillating, it is not proper to discredit the direct testimony of the eyewitnesses on such uncertain evidence. In such a situation unless the evidence of the eyewitnesses is shaken by some glaring infirmities, it would not be proper to doubt the correctness of their statements. We are, therefore, of the opinion that the High Court was wrong in its conclusion based on the vacillating evidence of the ballistic expert.[1]

8.21.5 Scientific Evidence v Eyewitness Account[48]

In other words, the position is that if we discard this part of the evidence of the eye-witnesses which has come to light for the first time in the sessions court, then according to medical evidence, the deceased would have got two gunshots whereas it was never the prosecution case that Ram Narain Singh or any other accused fired a second shot at the deceased at any time. The medical evidence, therefore, clearly falsifies the prosecution case regarding the manner in which the deceased was hit.

Even the ballistic expert on a question by the court deposed as follows:

48. *Ram Narain v State of Punjab*, AIR 1975 SC 1727 : (1975) 4 SCC 497 : 1975 Cr LJ 1500 (SC).

"In case if it is a straight fire, and if the right arm is kept just in front of the chest, then it is possible that these injuries could be caused by one single fire".

Thus, according to the ballistic expert's evidence, unless there was cogent material and reliable evidence to show that the deceased had kept his right arm in front of his chest, the deceased could not have sustained less than two injuries. The evidence of Surjit Singh and Joginder Singh of this point appears to us to be clearly an afterthought and cannot be accepted. Thus, the prosecution has not been able to explain how the deceased died by sustaining gunshot injury. Furthermore, the evidence of Dr. S.S. Walia shows that there were two gunshot injuries on Teja Singh, namely, injury No. 1 which by itself was sufficient to cause his death, and injury No. 4 which was also the result of the gunshot. The doctor has further opined in his cross-examination that both injuries Nos. 2 and 4 could have been caused from a distance of less than 4 feet and that there was blackening both in injury Nos. 4 and 2 which were on the uncovered parts of the body. The doctor further deposed that there was corresponding burning of the shirt by injuries Nos. 2, 3 and 4. If this be the position, then injury No. 4 is not at all explained. The blackening on injury No. 4 clearly indicates that this was also a gunshot injury and the ballistic expert has also testified to this effect at p 60 of the High Court paper book that in case the blackening which has been reported by the doctor in injury No. 2 and injury No. 4 were not the actual blackening due to the powder gases then it is possible that it could be from one single fire. The doctor, however, says nothing of this sort. Thus, a combined reading of the evidence of Dr. Walia, the medical expert and Mr. J.K. Sinha, ballistic expert, clearly establishes that the deceased died of two gunshot injuries and the prosecution has not been able to explain this important circumstance. For these reasons, therefore, the evidence of the two eye-witnesses Surjit Singh and Joginder Singh is wholly inconsistent with the medical evidence as also the evidence of ballistic expert and must be rejected on that ground alone, apart from other inherent improbabilities which appear in their evidence and which have already been pointed out.

Where the evidence of the witnesses for the prosecution is totally inconsistent with the medical evidence or the evidence of the ballistic expert, this is a most fundamental defect in the prosecution case and unless reasonably explained, it is sufficient to discredit the entire case.[1]

8.21.6 Unsatisfactory Report[49]

An expert opinion in firearm identification case should produce facts and not opinion which cannot be checked. Being the head of the Forensic Science Laboratory, the expert should know his responsibility towards the administration of criminal justice. He should give up the habit of producing his bald opinion. The expert should, if he expects his opinion to be accepted, put before the court all the material which induced him to come to his conclusion so that the court, although not an expert may form its own judgment on these materials. Bald opinions are of no use to the court and often lead to the breaking of very important links of prosecution evidence which are led for the purpose of corroboration.

The opinion given by Sri Prem Singh, Ballistic Expert, is bald and there is no data or reasons to arrive at the conclusion that the hole already there on the trousers of the injured could be caused by the pellet extracted from the calf of the injured. There is no opinion that the pellet extracted from the calf of the injured could be fired from the gun, Ex. 3, belonging to the appellant, nor could it be possible for the expert to give such an opinion because the gun was a muzzle-loading gun. The size of the shot recovered from the calf of the injured is .5075". There is no evidence of the size of the shots that were fired by the expert. The shot extracted from the calf of the injured was admittedly not fired by the expert in the test firing.

49. *Gopal Singh Gorkha v State of Uttar Pradesh*, 1991 All LJ 374 : 1991 (48) All Cri C 41 : 1991 Cr LJ 1235 (HC).

Thus, his opinion that the hole found on the trousers of the injured could be caused by the pellet extracted from the leg of the injured cannot be accepted. This opinion cannot be called as an expert's opinion so as to corroborate the ocular evidence on record.

If the opinions of the Doctor and of the Ballistic Expert are ignored then the only evidence left is of the injured himself and of the two witnesses namely Tara Dutt Bhat (P.W. 2) and Pani Ram (P.W. 3). As has been stated above Tara Dutt Bhatt (P.W.2) is admittedly the uncle of the injured. He claims to have gone along with the injured to see she-buffalo at a nearby place and while returning this occurrence took place. But these facts are wanting in the FIR. Similarly, P.W. 3 Pani Ram has stated that the appellant was abusing him and assaulting him on the main road. The injured Hari Charan Bhatt and the witnesses Tara Dutt Bhatt who were returning after seeing she-buffalo saw this occurrence and accosted the appellant that he had become old enough to come out on the road and hurl abuses. These facts are also wanting in the FIR. These facts appear to have been introduced in the evidence simply to make the presence of Tara Dutt Bhatt and Pani Ram probable at the time of occurrence. A suggestion has also been given to Pani Ram that he was "Halwaha" of the injured. In these circumstances the oral testimony does not repose much confidence.

It is also noteworthy that if the prosecution version is correct, the quarrel was going on between the appellant and Pani Ram. There was no occasion for the injured Hari Chand Bhatt to intervene and to pass any remarks against the appellant. This also makes the prosecution story highly unbelievable.

Thus, close scrutiny and analysis of the entire prosecution evidence show that some facts which were wanting in the FIR were introduced in the evidence in order to make the presence of Tara Dutt Bhatt (P.W. 2) and Pani Ram (P.W. 3) more probable. The occurrence took place in the evening on road when admittedly a large number of persons were present but none of them was examined. A great suspicion arises from the cuttings and over-writings in the injury report and Bed Head Ticket and also from the discrepancy in paras 4 and 5 of the Expert's report, Ex. Ka-2. Opinion of Ballistic Expert cannot be said to be an expert opinion and has to be discarded outright. Enmity between the injured and the appellant is admitted. In these circumstances, the possibility of false implication of the accused cannot be ruled out.

Before parting with the case it may also be pointed out that the muzzle of the gun when it was recovered from the appellant was found full of rust which was indicative of the fact that it was not used at all since long. P.W. 6 Prem Singh, the Expert, did not make any chemical analysis of the ingredients found on the walls of the muzzle of the gun. He has vaguely denied that what was found on the walls of the muzzle was rust. It is significant to note that he has stated that the residuary remains on the walls of the muzzle after the firing of test shots on analysis were found to contain lead and nitrate. This is highly misleading. Analysis of such remains after firing of test shots was not needed. It is clear that the contents found on the walls of the muzzle before firing of the test shots were not examined and so it cannot be said whether it was rust or traces of ammunition. Probability that the muzzle of the gun was full of rust at the time when it was recovered from the appellant cannot, therefore, be completely ruled out. That negatives the prosecution case that it was from the gun of the appellant that the shot in question was fired.

It has come in evidence that only one shot was fired. No pellets were found around the place of occurrence. Only one pellet entered the calf of the injured. It also seems highly improbable that the appellant would have chosen such an occasion to hit the injured when by his side in close proximity 3 or 4 other persons were also sitting.

In view of the above discussion, the prosecution has not successfully proved its case against the appellant and so the conviction of the appellant on the evidence on record cannot be sustained. The appeal must, therefore, be allowed.

8.21.7 Expert Evidence not Essential[50]

1. Whilst we are on this point, we may briefly indicate the nature of the prosecution case so far as the use of the guns is concerned. The appellant Gurcharan Singh had fired two shots, one of which killed Sukhjit Singh and the other Gurdial Singh. The appellant Surjit Singh had fired three shots, two at Arjan Singh and one at Piara. The evidence seems to show that Surjit Singh loaded the gun once in the presence of the witnesses and whilst so doing, he put two cartridges in the gun and the spent cartridges in his pocket. The two empties which had been sent for expert examination were found and picked up on a thoroughfare in front of the house of Jarnail Singh. Apparently, the prosecution case is that these two cartridges had been fired by the appellant Gurcharan Singh from Arjan Singh's gun picked up by him. In any event, the report shows that the two cartridges had been fired from the same gun. That is why the failure to prove the report cannot be said to have prejudiced the appellant's case at all.

Mr. Purushotam, however, argued that a ballistic expert should have been examined in order to ascertain whether the gun surrendered by Daljit Singh had been used at all. But this argument is obviously untenable for the simple reason that this gun was surrendered more than a week after the incident and it takes no imagination to realise that when Daljit Singh surrendered the gun, he must have cleaned it so as to remove any evidence about its use on the date of the incident.

It has, however, been argued that in every case where an accused person is charged with having committed the offence of murder by a lethal weapon, it is the duty of the prosecution to prove by expert evidence that it was likely or at least possible for the injuries to have been caused with the weapon with which, and in the manner in which they have been alleged to have been caused; and in support of this proposition, reliance has been placed on the decisions of this court in *Mohinder Singh v State of Punjab*[51]. In that case, this court has held that where the prosecution case was that the accused shot the deceased with a gun, but it appeared likely that the injuries on the deceased were inflicted by a rifle and there was no evidence of a duly qualified expert to prove that the injuries were caused by a gun, and the nature of the injuries was also such that the shots must have been fired by more than one person and not by one person only, and there was no evidence to show that another person also shot and the oral evidence was such which was not disinterested, the failure to examine an expert would be a serious infirmity in the prosecution case. It would be noticed that these observations were made in a case where the prosecution evidence suffered from serious infirmities and in determining the effect of these observations, it would not be fair or reasonable to forget the facts in respect of which they came to be made. These observations do not purport to lay down an inflexible rule that in every case where an accused person is charged with murder caused by a lethal weapon, the prosecution can succeed in proving the charge only if an expert is examined. It is possible to imagine cases where the direct evidence is of such an unimpeachable character and the nature of the injuries disclosed by post-mortem notes is so clearly consistent with the direct evidence that the examination of a ballistic expert may not be regarded as essential. Where the direct evidence is not satisfactory or disinterested or where the injuries are alleged to have been caused with a gun and they *prima facie* appear to have been inflicted by a rifle, undoubtedly the apparent inconsistency can be cured on the oral evidence of a ballistic expert. In what cases the examination of a ballistic expert is essential for the proof of the prosecution case, must naturally depend upon the circumstances of each case. Therefore, we do not think that Mr. Purushotam is right in contending as a general proposition that in every case where a firearm is alleged to have been used by an

50. *Jai Dev and Hari Singh v State of Punjab*, AIR 1963 SC 612 : (1963) 3 SCR 489 : (1963) 1 Cr LJ 495 (SC).
51. AIR 1953 SC 415 : 1953 Cr LJ 1761 (SC).

accused person, in addition to the direct evidence, prosecution must lead the evidence of a ballistic expert, however, good the direct evidence may be and though on the record there may be no reason to doubt the said direct evidence.[1]

2. The last argument which Mr. Anthony has urged before us is that the prosecution should have examined a ballistic expert in this case and since no expert has been examined, it cannot be said that the prosecution has proved its case that the appellants caused the deaths of the two victims by shooting from the rifles which they carried. In support of this argument, Mr. Anthony has referred us to the decision of this Court in *Mohinder Singh v State of Punja.*[52]

Now, the story about the recovery of this revolver is very interesting. According to the defence, Amin Lal was carrying a revolver and when he was hit with a lathi by Sajjan Singh, the revolver fell down from his hands and Yudhbir Singh picked it up and fired it at Amin Lal. Now this revolver was carried away by Yudhbir Singh to his house and said that he produced the same before the police investigation officer. On the other hand, according to Gurbux Singh, it was the accused Sajjan Singh who after his arrest produced the pistol and two live cartridges before him. It would thus appear that the revolver had been produced by one of the accused persons on the allegation that it was carried by Amin Lal and had been used by Yudhbir Singh in self-defence after it had fallen down from Amin Lal's hands. It has not been the prosecution case that it is this revolver which had been used by Yudhbir Singh. It may well be that the revolver has been deliberately surrendered by the accused in order to introduce complications in the case. We think, in such a case it is difficult to understand for what purpose the prosecution was expected to examine the expert. Therefore, in our opinion, the decision in the case of *Mohinder Singh*,[53] has no application to the case before us.

8.21.8 Photographs not Indispensable[54]

The evidence of P.W. 26 is also attacked by the defence on the ground that he has not taken the microscopic photographs of the pin marks of the cartridges and furnished the other data of the microscopic findings shown by the diagrams to satisfy the court that the characteristic pin marks of the cartridges M.O. 15 recovered in this case are found to be identical with that of the test fired cartridges. In the case of *Ramanathan v State of Tamil Nadu,* 1978 Cri LR (SC) 318 : 1978 Cr LJ 1137 : AIR 1978 SC 120, it is held by the Supreme Court as follows:

> *It is true that there has been considerable difference of opinion amongst the investigators regarding the use of photographs in a court for the purpose of illustrating the matching of the markings and while it may be that microscopic photograph, when taken with due care and in the best of conditions, may enable the evidence to be placed on the record in a visible form, it cannot be denied that a court would not be justified in rejecting the opinion of an expert who has examined the markings under the comparison microscope simply for the reason that he has not thought it necessary to take the photographs.*

In view of this law laid down by the Supreme Court, the evidence of P.W. 26 cannot be rejected merely on the ground that he has not taken the photographs of the cartridges concerned. He has also explained that he could not take the photographs for want of films.

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52. *Ibid.*
53. *Mohinder Singh v State of Punjab*, AIR 1953 SC 415 : 1953 Cr LJ 1761 (SC).
54. *SG Gundegowda v State,* 1996 Cr LJ 852 : 1996 (1) Kant LJ 150 : 1996 (1) Rec Cri rule 416.

8.21.9 Linking Evidence[55]

There are certain other factors to which our attention has been drawn by the learned counsel. His submission is that the prosecution also rested its case on the fact that the cartridge which had been found and taken over by the investigating officer had been fired by the gun of the appellant. There is no controversy that 10 cartridges had been sold to the appellant at Varanasi, as it has also been admitted by the appellant himself in his statement under section 342 of the Cr PC The seller of the cartridge, namely Santosh Kumar Mukherjee, has been examined in the case and he has proved the original cash memo which he had given to the appellant which has been marked Exhibit 2. He had also brought the carbon copy of the cash memo. He also proved the sale voucher, which is Exhibit 3, and also the signature of the appellant thereon which were marked Exhibit three-first. Learned counsel urged that the gun and the cartridge had been sent to the arms expert, who has been examined as P.W. 6 in the case. His evidence was required to determine whether the cartridge which had been seized was used in the gun produced by the appellant or not is that on 25 July 1966 he had received a double barrel gun along with one fired cartridge case. He found the left barrel of the gun coated with a quantity of fouling, indicating that it was fired previously, and the gun was in perfect working condition. With the said gun he fired two cartridges and compared the three fired cartridges under comparison microscope and found similar striker and breech face markings on the percussion caps of the fired cartridges. He proved his report which was marked Exhibit 5, and explained that next to balls, L.G. shots were the biggest, having 6 shots in each 2½" cartridge.

8.21.10 *Bona Fide* of Expert[56]

Mr. Prasad's contention is that it has not been established in the case that P.W. 6 was entitled to claim that he was an expert so that his evidence could be made admissible. The prosecution had not asked any question so as to indicate that he had sufficient training, knowledge and experience as to justify him to be called an expert and, as such, it is urged that his opinion could not be the last word on the subject. This part of the submission cannot be accepted, because no challenge was made in cross-examination. Besides, it is for the court to decide the question of competency or fitness of a witness who claims to be an expert. In this case I am satisfied that the learned judge before whom P.W. 6 was examined appears to have been satisfied that he was firearm expert under government of Bihar, therefore, his competency cannot be now questioned at this stage.

The next question that, however, still remains to be determined is the value of the evidence of P.W. 6. Learned counsel has contended that the record does not furnish the materials which had helped the expert in coming to his conclusion as he has done in this case and the court has not the advantage of looking into those materials so as to hold that the expert was justified in the opinion that he has given. Besides, it is said other materials have not been produced and as such, there can be no guarantee that the expert had either examined the gun and the cartridge with the help of those materials at all. If, on the other hand, he had so done, whether his conclusions had been rightly arrived at.[1]

8.21.11 Inordinate Delay[57]

It is significant to note this connection that the gun and the cartridge had been received by P.W. 6 on 25 July 1966, but his examination was not completed until 13 May 1967. He

55. *State of Bihar v Hanuman Koeri*, 1971 Cr LJ 187 (Pat).
56. *Ibid.*
57. *Ibid.*

even admitted in his cross-examination that he might have commenced the examination a day or two earlier, though he did not remember the exact date of the commencement of the examination. This inordinate delay in the examination of the ballistic expert is to be deplored and it is unfortunate that in such serious cases, the expert does not attach sufficient importance for speedy examination and submission of his report. I might also mention that the occurrence in the present case having taken place between the 5th and 6 July 1966, the charge-sheet could not be submitted until 25 July 1967, and the expert (P.W. 6) is largely to be blamed for this delay. It is to be hoped that the attention of the authorities concerned and particularly of firearms expert (P.W. 6) will be drawn to these observations so that thereafter there may not be such deplorable delay in such matters.

8.21.12 Inadequate Evidence[58]

No doubt, the gun has been recovered from the house of the accused, as stated by P.Ws. 6, 7 and 9. This gun was sent to the ballistic expert. But the pellets recovered were not sent to him. It has been mentioned in the report of the ballistic expert:

> *"It is not possible to say when the gun was last used for firing as final products of residue have already been formed".*

There is also no other evidence to show that the shot was fired from this particular gun. So without any convincing evidence that the gun was used by the accused, mere recovery of the gun will not in any way help the prosecution.

8.21.13 Data[59]

Coming back to the submission of learned counsel on the evidence of P.W. 6, I think that the submission must be accepted as correct. It also finds support from a decision of the Supreme Court in *Kalua v State of Uttar Pradesh*.[2] In *Kalua's* case, the accused was convicted for the murder of the deceased by shooting him with an improvised (improvised) pistol. A cartridge was found near the cot of the deceased, and the accused was arrested fourteen miles away from his village which was the place of occurrence. He produced a pistol from his house in circumstances which clearly showed that he only could have known of its existence there. The evidence of the firearm expert showed that he had fired four test cartridges from the pistol produced by the accused. He found the individual characteristics of the chamber to have been impressed upon the test cartridges and that exactly identical markings were present on the paper tube of the evidence cartridge. He made photomicrographs of some of these individual marks on the test cartridges and the evidence cartridge, and gave his opinion that the cartridge found near the cot of the deceased was fired from the pistol produced by the accused. The High Court held, which was approved by the Supreme Court, that the firearms expert has made the necessary tests, he appeared to have been careful in what he did. There was no good reason for distrusting his opinion. It would, therefore, appear that in the said case all the materials which had helped the firearm expert in coming to his conclusion were produced in the trial court and the High Court had the advantage of considering those matters and was satisfied that the firearms expert had carefully made the necessary tests. In the instant case, no material has been furnished and, therefore, we are unable to hold whether or not the firearms expert, namely, P.W. 6 had been careful in carrying out the necessary tests before giving his opinion as contained in the report and testified to the court. This is a serious infirmity in the prosecution case. The learned standing counsel had, however, urged that since P.W. 6 was not crossed-examined on these matters, it must be assumed that the method of examination by

58. *Ibid.*
59. *Ibid.*

the expert of the gun and the cartridge was no longer open to doubt. There is no justification for this argument, because the prosecution is under duty to produce every scrap of material which would help in coming to a just decision in the case, irrespective of the fact whether those materials go against the prosecution or in its favour.

8.21.14 Contradictory Evidence[60]

The appellant, who had a rifle with him shot at Labh Singh from behind his back as he was attempting to run away. Labh Singh died on the spot. The small intestines were torn up and the left kidney was found smashed. The circular wound of entry at the back of the deceased one-fourth" in diameter, had burnt and inverted margins according to the doctor who conducted the post-mortem examination. The ballistic expert deposed that if there were burnt edges of the wound, the distance between the muzzle and the victim would only be a few inches and not more than nine inches. This opinion is in substantial accord with what is found in some of the textbooks on medical jurisprudence. For instance, it is stated in *Taylor's Principles and Practice of Medical Jurisprudence*, Vol I, 10th Edn., at p 441, under the heading "Burning of the Wound":

It is impossible to state rules as to the precise distance from which it is impossible to produce marks of burning, for this depends on the quantity and nature of the power, the method of charging, and the nature of the weapon. It is unusual, however, to get marks of burning beyond a yard or a yard and a half with a shotgun, or at more than half a yard with a revolver.

According to the medical evidence, therefore, the shot was fired from very close range about 9 inches to a yard or a yard and a half but according to what was shown to the draftsman of the plan by the eye-witnesses the rifle was fired from a range of about 25 feet. This difficulty cannot be surmounted, as was sought to be done by the High Court, as the eye-witnesses were not giving an estimate of the distance but showed to the draftsman the particular spots where the appellant and the deceased stood at the time of firing. Thus, in the face of the medical evidence, the testimony of the eye-witnesses cannot be safely accepted.[1]

8.21.15 Number of Firearms[61]

1. Neither the genuineness of the recoveries of the empties from the roof of the house of Bhag Singh nor the recovery of gun Ex. P. 12 from the person of Bhag Singh at the time he was apprehended has been challenged on behalf of the defence nor the correctness of the opinion given by the ballistic expert has been challenged on its behalf. It has, however, been urged by Shri Dara Singh, counsel for the appellants that according to the statement given by Shri J.K. Sinha, Assistant Director, Forensic Science Laboratory, Chandigarh P.W. 20, who examined and tested the three empty cartridges, Ex. P 13/1.3 recovered from the roof of the house of Bhag Singh appellant, they were fired from gun, Ex. P. 12 used by Bhag Singh appellant and that no empty cartridge has been recovered used in the gun, with which Mehar Singh appellant was armed and with which, according to the evidence of the eye-witnesses, he fired one shot at Basant Singh deceased. The question of recovery of empty cartridge dropped from the gun of Mehar Singh appellant will arise only, if there is evidence to show that after Mehar Singh fired his shot at Basant Singh, deceased, he emptied his gun. It is nowhere stated by any of the eye-witnesses, and no such question was asked from them in course of their cross-examination, that after Mehar Singh had fired his shot he emptied the gun.

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60. *Santa Singh v State of Punjab*, AIR 1956 SC 526 : 1956 Cr LJ 930 (SC). Also see *Mansuri Nizamuddin v State of Bihar*, AIR 1955 Pat 330 : 1955 Cr LJ 1092 (Pat); *Khalak Singh v State of Madhya Pradesh*, AIR 1957 MP 153 : 1957 MPC 461 : 1957 Cr LJ 1138 (MP); *Abdul Samad v State of Orissa*, ILR 1964 Cut 623.
61. *Bhag Singh v State of Punjab*, 1971 Cr LJ 903 (P&H).

8.21.16 Number of Shots from Injuries[62]

The learned counsel further contends that it was doubtful that 12 rounds would have been fired. He points out the number of injuries received by the villagers. But these injuries support the prosecution story. From the injuries on the various persons examined by Dwarka Nath Prasad, P.W. 41, apart from the persons who had died and whose bodies had been held to have been cremated by unidentified persons, it appears that 20 persons had received gunshot injuries; one of them had as many as 14 lacerated wounds and another had 10 lacerated wounds. Apart from that there is no reason to doubt the oral evidence given in this case that a number of rounds were fired.

8.21.17 Illusory Discrepancy[63]

The only point, which has been canvassed seriously before us by Mr. Umrigar who appeared in support of the appeal, is that the story put forward by the prosecution, namely that Thanni was killed by a pistol shot fired by Nawab Singh is materially contradicted by the medical report and the evidence of some of the prosecution witnesses. It is pointed out that the medical report shows that there were a number of gunshot wounds in the body of the victim and in Ex. P-6 it is clearly stated that an empty 12 bore cartridge was recovered from where the body of the victim lay. It is argued that in these circumstances the prosecution story, that Thanni was killed by a pistol shot fired by Nawab Singh cannot possibly stand; and in cases like this where death is due to injuries or wounds caused by a lethal weapon, it is incumbent upon the prosecution to prove by expert evidence, if necessary, that it was likely or at least possible for the injuries to have been caused with a weapon with which they were alleged to have been caused.

The point, it may be noted, was not raised before the High Court either during the hearing of the appeal or even at the time when the appellant applied for leave to appeal to this court. It seems to us that the point is without substance and the apparent discrepancy upon which the learned counsel lays stress appears on close examination to be wholly illusory. The prosecution story undoubtedly is that Nawab Singh carried a pistol with which he fired at Thanni. The pistol, however, was country made one and P.W. 6 expressly states that 12 bore cartridges could be fired in such pistols.

This story was accepted by the additional sessions judge and there is nothing improbable, therefore, in the recovery of a 12 bore exploded cartridge being found near the body of the victim, or in the presence of multiple injuries in his body. It is not the case of the prosecution that only one shot was fired by Nawab Singh. It may be further mentioned that the expression gun fire was used in the ordinary and colloquial sense by the prosecution witness and the evidence clearly indicates that they did not mean that the shot was fired from a gun and not from a pistol. The contention of the learned counsel must, therefore, fail.

8.21.18 Number of Murderers and the Murdered[64]

As a mere proposition of law, it would be difficult to accept the argument that the sentence of death can be legitimately imposed only where an accused person is found to have committed the murder himself. Whether or not sentences of death should be imposed on persons who are found to be guilty not because they themselves committed the murder, but because they were members of an unlawful assembly and the offence of murder was committed by one

62. *Ram Prasad Sharma v State of Bihar*, AIR 1970 SC 326 : (1970) 1 SCR 694 : 1970 Cr LJ 496.
63. *Nawab Singh v State of Uttar Pradesh*, AIR 1954 SC 278 : 1954 Cr LJ 738 (SC).
64. *Masalti v State of Uttar Pradesh*, AIR 1965 SC 202 : (1965) 1 Cr LJ 226 : 1965 (1) SCJ 605.

or more of the members of such an assembly in pursuance of the common object of that assembly, is a matter which has to be decided on the facts and circumstances of each case. In the present case, it is clear that whole group of persons belonged to Laxmi Prasad's faction, joined together armed with deadly weapons and they were inspired by the common object of exterminating the male member in the family of Gayadin. Ten of these persons were armed with firearms and the others with several other deadly weapons, and evidence shows that five murders by shooting were committed by the members of this unlawful assembly. The conduct of the members of the unlawful assembly both before and after the commission of the offence has been considered by the courts below and it has been held that in order to suppress such fantastic criminal conduct on the part of villagers it is necessary to impose the sentences of death on 10 members of the unlawful assembly who were armed with firearms. It cannot be said that discretion in the matter has been improperly exercised either by the trial court or by the High Court. Therefore, I see no reason to accept the argument urged by Mr. Sawhney that the test adopted by the High Court in dealing with the question of sentence is mechanical and unreasonable.

8.21.19 Missed Cartridge as Evidence[65]

The cartridges were sent to the Forensic Science Laboratory. There is the evidence of Mr. J.K. Sinha and his report is marked Exhibit P-21. He said that two sealed parcels were received in the laboratory on 12 May 1969. One of the sealed parcels contained one .303 bore rifle marked 'A' by him. That is the rifle received from the appellant. The second sealed parcel contained two .303 fired crime cartridge cases and one .303 missed cartridge. His evidence was that the two fired crime cartridges had been fired through the .303 rifle. His opinion about the missed cartridges was that the firing pin impression on the missed cartridge tallied with the firing pin impression on the .303 rifle marked "A". He examined the two fired test cartridges. He also examined the test cartridges under a comparison microscope for individual characteristic markings present on them. He compared the same with individual characteristic markings present on the fired or crime cartridges. On comparison, he found that the firing pin marks present on the test cartridges tallied with the firing pin marks present on the crime cartridges in their individual characteristics. Dr. Sinha said that the fired cartridges were fired through the rifle marked "A" and could not have been fired from any other rifle even of the same make and bore because every firing pin has its own individuality. He took photomicrograph which showed some of the similar individual characteristics.

The rifle was under a sealed cover. It was opened in this court. The magazine chamber was found to have the same number as in the report Exhibit P-10. The submission on behalf of the appellant that there was a difference between the number of the rifle in the magazine chamber and in the report was, therefore, not acceptable.

The entire evidence was rightly believed by the High Court. The High Court then correctly confirmed the capital sentence. The appeal fails and is dismissed.

8.21.20 Wads as Evidence[66]

We have a vague indication that these two jointly, or one of them, might have had something to do with the killing of Khandiya because the corpse was found just outside their house and the killing was with a muzzle-loading gun and Chima has a muzzle-loading gun and further, though these points are not so definite, the wadding found in one of the gunshot wounds in the corpse was similar to the wadding found in Chima's house, and the gun itself had signs

65. *Mukhtiar Singh v State of Punjab*, AIR 1971 SC 1864 : 1971 Cr LJ 1298 (SC) : 1971 UJ (SC) 582.
66. *Chima Mahariya v State of Madhya Pradesh*, 1969 Jab LJ 525 : 1969 MPLJ 524 : 1969 Cr LJ 1291 (MP).

of having been used sometime before the examination. The problem then is whether this is sufficient, and if so, whether they were acting with a common intention, or, which comes to the same thing, each abetting the other, and if each was acting independently which of the two it was. In the absence of common intention, the evidence has to be led pointing to one out of the two because the shooting of the gun was a one-man job whoever it was.

The result is that apart from the statements attributed to either of the accused persons there is really no evidence against either jointly or individually. Something like a circumstance is found in the fact that a muzzle-loading gun had been used; but even that is not very illuminative because it has not been brought out that Chima is the only owner of a muzzle-loading gun in that village. Wadding of the type found in one of the wounds and also in Chima's house is of a common variety; but assuming that Chima Bhilal's gun had been used and then put on the dung heap, that by itself while creating suspicion may not point to one or the other definitely as the offender. One of the two might have used it. Each of them had at different stages been anxious to take the blame on himself or herself and spare the other and each indicated that they were justified in shooting Khandiya. If there was any other evidence we could pin the responsibility on one of the two definitely or even make out common intention; but we have nothing. Thus, it would be a case of no common intention and uncertainty to which of the two had shot. Further, if one takes into account the recorded statement of the woman, then again it would be a case of justification in self-defence as the person killed was trying to abduct her with the intention of compelling her to sexual intercourse. If we reject that statement, nothing is left. The only conclusion a court can arrive at is that it is a fit case for the benefit of doubt to both the appellants.

8.21.21 Firearm Evidence[67]

The reasons 4, 5 and 7 mentioned above from the trial court judgment may be taken up together. Either there was delay in giving information to the police or unexplained delay in the various steps taken by sub-inspector Sis Ram. The police station was at a distance of about 3 kilometres from the hospital. It does not stand to reason that the Ruka sent by the doctor took more than two hours to reach the sub-inspector at the police station and that the latter took an hour and a half in reaching the hospital after receipt of the Ruka. The copy of the First Information Report was received by the Illaka Magistrate at 7.30 am in the morning. Although there was no evidence in support of the suggestions thrown on the side of the respondent, the possibility of the suggestions being true could not be ruled out. Viewed in the background of the very suspicious story of the apprehension of the respondent on the 2 March 1970 at Agroha turning the story of snatching the fore-end of the gun by Manphool becomes very doubtful. From the evidence it is not clear how far this Agroha turning is from village Kajla. But Jagdish, P.W. 10, it is interesting to find, happened to be at Agroha turning just by chance although he is a resident of a village 20 miles away from there. He is also related to the deceased. He was a witness to the seizure of the gun from the person of the respondent at Agroha turning. His evidence was too crude on its face to inspire any confidence as to the arrest of the respondent at Agroha turning with the Phattiless gun. The High Court, in our opinion, has wrongly accepted this evidence as against its rejection by the trial court. It is strange that Sis Ram could find the respondent present at the Agroha turning just by chance and P.W. 10 also a ready witness by chance. In this background the suggestion on behalf of the respondent that his licensed gun was taken away from his house soon after the occurrence in the same night although not proved by any evidence, does cast doubt on the prosecution story as to the manner of Manphool's catching hold of the Phatti. P.Ws. 4 and 5 are also licensed gun holders. If the story of separation of the Phatti

67. *Bahal Singh v State of Haryana*, AIR 1976 SC 2032 : (1976) 3 SCC 564 : 1976 Cr LJ 1568.

on Manphool's pouncing upon the respondent was correct, the three persons present at the scene of occurrence, if at all they were present, could have succeeded in catching the respondent with his gun. It was a single barrel gun and after one shot was fired it could not be reloaded on the detachment of its fore-end. There would have been, therefore, no fear or risk in the witnesses pursuing and apprehending the respondent with his gun at or near the place of occurrence. There are houses of persons around the scene of occurrence. The occurrence is said to have taken place at about sunset time. There must have been present independent persons in the village to watch the occurrence if it did take place in the manner alleged. But there was no such witness coming forward. The High Court remarked that some persons came immediately after the occurrence. But none of them was examined to say whether any of the three eye-witnesses was present at the scene of occurrence or any of them told the persons who arrived there the name of the respondent as being the assailant of the deceased.

8.21.22 Location and Recovery of Projectiles through X-rays[68]

We cannot part with this case without making reference to certain defect in the investigation and in the conduct of the doctor (P.W. 64) who held the post-mortem examination on the dead body of Prawakar. According to the post-mortem report there were gunshot wounds. The entrance wound was noticeable but not the exit wound. It was the duty of the Medico-legal expert (P.W. 64) to have directed X-ray examination of the dead body to determine if bullets were located in the body. It was the duty of the I.O. to see if bullets were inside the dead body and if those bullets, if recovered, were proved by ballistic examination to have been shot from the revolver (M.O. XXXVI) which admittedly belonged to Srinivas and from whose possession it was recovered. We cannot disabuse our mind of the impression that this omission cannot but be deliberate. The matter was so patent that no investigating officer would ignore it.

8.21.23 Non-Recovery of Projectiles[69]

The medical evidence disclosed that Shiv Singh, the deceased, had three gunshot wounds in his body, all in front; two on the chest and one in the stomach. All the three wounds were on the left side of the front of the body. The doctor said that any one of the three injuries would have proved fatal in itself and that all the three wounds could be caused by a single discharge from a gun.

Unfortunately, none of the shots or the bullets have been recovered. If they had been recovered, it would have been easy to determine whether they were fired from one gun or two. One of the guns alleged to have been used was a breech-loading double barrel gun with hammer action. The other was an old-fashioned muzzle-loader. Presumably, the type of shot used in the more modern weapon would have been different from the crude pellets or slugs one would expect in a muzzle-loader. Appellant *B* had admitted his guilt from the start and has taken all the blame on himself. Appellant *A*, on the other hand, has denied throughout that he has taken any part in the shooting though he admitted he was present at the scene with a gun in his hand too. The fact on which everyone is agreed is that two shots were fired. But the question is whether *B* fired both as he said or whether he fired one and *A* fired the other. The medical evidence does not disprove the defence version. The doctor said one shot could have caused all the three wounds. If one, then of course two could equally have caused three wounds and those two shots could have been fired by one person. The post-mortem examination does

68. *State of Orissa v Ram Chandra Bhoi*, AIR 1965 Ori 175 : (1965) 2 Cr LJ 520.
69. *Hate Singh Bhagat Singh v State of Madhya Bharat*, AIR 1953 SC 468 : 1953 Cr LJ 1933 (SC) : 1952 MBLR (Cri) 1.

not prove the contrary. The unfortunate omission to recover the shots or slugs in the body has deprived the court of evidence which might have been of great value on this point. The defence version was that *B* had the double barrel gun and that he fired two shots from it. *A* did not use his gun which according to the defence, was the old-fashioned single barrel muzzle-loader. Therefore, in the absence of any reloading the double barrel gun would have both barrels barren of live rounds and would be found in an unloaded condition. The muzzle loader, unless it was already empty, would still be loaded. Now, it has been accepted throughout that the muzzle-loader was found loaded when it was seized. The question is about the double barrel gun. One of the witnesses to the seizure admitted that only one gun was found loaded though he could not remember which one. There is no reason why his admission should be brushed aside. It accords with the defence version in a very material and important particular. The appeal of *A* is allowed.

8.21.24 Safe Custody and Genuine Recovery[70]

1. After having been taken through the evidence on record, we have no doubt regarding the complicity of Paramjit Singh and Gurdev Singh. Paramjit Singh, according to the testimony of the eye-witnesses, was armed with a rifle and Gurdev Singh with a gun. Paramjit Singh in his statement before the committing magistrate admitted that he had a rifle, but, according to him, he had already sold that away. Gurdev Singh undoubtedly owned licensed gun P-2. According to the evidence of Dr. Ajit Singh who performed post-mortem examination on the body of Sukhdev Singh, Sukhdev Singh had a number of bullet injuries. Sukhdev Singh had also a number of injuries caused by gunshots. The evidence of the eye-witnesses with regard to the part played by Paramjit Singh and Gurudev Singh is thus in conformity with the medical evidence. Although Paramjit Singh played the leading part in the assault on the two deceased persons, his rifle could not be recovered as he absconded after the occurrence and remained absconding for a period of more than eight months till his arrest on 11 April 1972. Gurdev Singh surrendered himself in the court of judicial magistrate Sunam on 17 August 1971. It is in the testimony of Shri J.K. Sinha, Assistant Director, Forensic Science Laboratory that three of the crime cartridges which were received in the laboratory on 11 August 1971 has been fired from licensed gun P-2 of Gurdev Singh. According to the evidence of sub-inspector Ajit Singh (P.W. 19) and Mann Dass (P.W. 4) gun P-2 was recovered in pursuance of the disclosure statement of Gurdev Singh subsequent to his surrender in court. There is no material to warrant the inference that gun P-2 was secured by the police before Gurdev Singh surrendered in court on 17 August 1971. ASI Amrik Singh (P.W. 20) has deposed that he recovered a number of empty cartridges from the place of occurrence. Out of those empty cartridges, three were found by Shri Sinha to have been fired from gun P-2 of Gurdev Singh. There could, in our opinion, be hardly any doubt on the point that the three cartridges fired from the gun of Gurdev Singh were found at the spot because those empty cartridges were sent to the ballistics expert long before the arrest of Gurdev Singh and the recovery of his gun. It is significant that gun P-2 of Gurdev Singh is his licensed gun. No question of foisting a licensed gun upon Gurdev Singh could possibly arise in the very nature of things. It was also not possible to falsely show the recovery of three empty cartridges which had been fired from that gun because at the time those three empty cartridges were sent to the Forensic Science Laboratory, the police were not in possession of gun P-2 of Gurdev Singh. The despatch of the three empty cartridges which had been fired from the licensed gun P-2 of Gurdev Singh lends assurance to the evidence about recovery of those cartridges from the place of occurrence. The fact that three of the cartridges fired from the gun of Gurdev Singh were found at the place of occurrence goes a long way to corroborate the testimony of the three eye-witnesses regarding the complicity of Gurdev Singh.

70. *Nachhittar Singh v State of Punjab*, AIR 1975 SC 118 : (1975) 3 SCC 266 : 1975 Cr LJ 66 (SC).

8.21.25 Proof of Motive not Indispensable[71]

Be that as it may, the failure of the prosecution to establish the motive for the crime does not mean that the entire prosecution case has to be thrown over-board. It only casts a duty on the court to scrutinize the other evidence, particularly of the eye-witnesses, with greater care. The High Court was fully conscious of the need for such caution, and rightly observed:

The absence of proof of motive has this effect only that the other evidence bearing on the guilt of the accused has to be very carefully examined.

Indeed, the High Court did so. The conviction of the appellant mainly rests on the evidence of Bhagwan Kaur, P.W. 2, which had been corroborated in material particulars by independent evidence, including that of the ballistic expert, Mr. J.K. Sinha.

* * * * *

Then, there was the testimony of Mr. J.K. Sinha, ballistic expert who after examination of the empties (which were found at the scene of the murder on the 18th December) and the licensed gun of the appellant, opined that those empties had been fired through the barrel of this gun.

Mr. Singh, however, contends that no empty cartridges had, in fact, been found at the spot, and that this circumstantial evidence had been fabricated after the arrest of the appellant and seizure of the gun which took place on the 19th December.

* * * * *

The courts below have for cogent reasons rejected the defence contention and accepted the prosecution version that the appellant was taken into custody along with his gun, on the 24th December. We find no fault with that reasoning. The gun having been seized by the police on the 24th, there was no scope for fabrication, nor any ground for doubting the genuineness of the empties picked up from the scene on the 18th December, and which on the 24th December were no longer in the possession or control of the investigating officer. They were as deposed to by Shri J.K. Sinha, P.W. 12, in the possession of the Forensic Laboratory since the 21st December.

The testimony of Shri J.K. Sinha had not been seriously challenged in cross-examination. In his opinion the crime cartridges had been fired from the gun of the appellant. Thus the ballistic evidence confirmed the connection of the appellant with the crime.

8.21.26 Critical Appraisal of Identification Evidence[72]

In regard to Balak Ram, there is a concurrent finding that the shot fired by him caused the death of Radhey and we see no reason for taking a different view. The evidence in regard to the part played by him is natural and consistent and is corroborated by the opinion of the ballistic expert. Such corroboration was lacking as against others. The evidence of the ballistic expert shows that the bullet (Ex. 27) which was extracted from Radhey's body was fired from the pistol (Ex. 5) belonging to Balak Ram. Mr. Anthony made a severe attack on the evidence of the expert and in order to show infirmities in that evidence he read out to us various passages from *the identification of firearms and forensic ballistic by Major Gerald Burrard; J.S. Hatcher's Test Book of Firearms Investigation, Identification and Evidence* (5th Edn., 1946) and *Modi's Medical Jurisprudence and Toxicology*. We have considered these submissions but are unable to see a reason strong enough to justify a reversal of the

71. *Nachhittar Singh v State of Punjab*, AIR 1975 SC 118 : (1975) 3 SCC 266 : 1975 Cr LJ 66 (SC).
72. *Balak Ram v State of Uttar Pradesh*, AIR 1974 SC 2165 : 1974 Cr LJ 1486.

concurrent view taken by the two courts. The normal rule that this court does not reappraise evidence in such cases must apply.

Stated briefly, Mr. Anthony's contention is that the bullet (Ex. 25) which was recovered from the scene of offence must have been the one which after hitting Tribeni Sahai made an exit wound and since that bullet, according to the ballistic expert, could not have been fired from Balak Ram's pistol (Ex. 5), he cannot be held guilty for causing the death of Tribeni Sahai, Mr. Anthony says that the evidence of the eye-witnesses stands falsified by the evidence of the expert. The difficulty in accepting this connection is that there is no warrant for saying that the bullet Ex. 25 must be the one which passed through Tribeni Sahai's body.

Mr. Anthony spent considerable time in showing that the striations on the bullet (Ex. 27) which was extracted from Radhey's body are of a different pattern from the striations on the test bullets fired from Balak Ram's pistol. The evidence of the expert has been closely considered by the High Court and we consider their finding on this aspect as open to no exception.

8.21.27 Range of Fire[73]

Ballistic Expert (P.W. 12) has opined in his report (Ex. P-12) that judging from the area of dispersion of the pellet holes on the shirt and body of the deceased, the gun must have been fired from a distance of 10 to 15 yards. He has further stated in the report that if the gun had been fired from a distance of 8 to 10 feet, as contended by the accused, some type of blackening would have been present on the shirt; but he did not find any blackening on the shirt (article-E), which the deceased was wearing. In his report as well as in his testimony, P.W. 12 has expressed the opinion that the distance from which the shot was fired at the deceased would not be less than 10 to 15 yards. In spite of elaborate cross-examination, nothing whatever has been brought out to discredit the testimony of this witness or to doubt the soundness of the opinion expressed by him. It is, no doubt, true that Dr. Gurjar (P.W. 2) has stated in his evidence that he had found burn-marks at five places on the shirt of the deceased and that in view thereof, he was of the opinion that the distance between the assailant and the victim, at the time when the gun was fired, was not more than 10 feet. Significantly, no mention whatever has been made by P.W. 2 in the post-mortem report that there were any burn-marks or charring marks on the body of the deceased at the places of entry of the pellets. Nowhere, in the course of his observations concerning the external appearance of the body of the deceased, do we find any mention by the Medico-legal expert of burn-marks. It is only in the concluding portion of the post-mortem report, under the heading "remarks regarding articles sent for examination along with the dead body" that there is a description of the shirt of the accused, as having been burnt in about five places. The said shirt which the deceased had been wearing at the time of the occurrence had been forwarded to the Ballistic Expert also, and after examining it P.W. 12 has clearly stated in the report (Ex. p 12) as follows:

> *Shirts-1 having bloodstains and 5 holes on the front left side (three of big size and two of small size). There is no blackening present around the holes.*

P.W. 12 has confirmed the truth of this observation in the oral testimony given in court. We, are satisfied that the adverse comments made by the High Court against the conduct of the Medico-legal expert (P.W. 2) are fully justified. In our opinion, the High Court acted rightly in disbelieving the evidence given by P.W. 2 on this aspect and accepting as true the observations made by P.W. 12 in his report (Ex. p 12). The expert opinion given by him in the said report as well as in his oral testimony was rightly relied on by the High Court.[1]

73. *Kishore v State of Orissa*, AIR 1967 Ori 121 : 1967 Cr LJ 1155 (HC).

On one material point range of firing of the gunshots which killed the deceased, the questions arise: From what distance the gunshots – which killed the deceased – were fired? Is the evidence consistent with the prosecution case of the gunshots having been fired from the wall of Kamraj's house which is at a distance of 38 feet? The medical evidence of the doctor P.W. 8 who held the post-mortem examination finding that there were as many as five gunshot wounds on the deceased all over the body – left lateral side of the forehead, left side abdomen lateral, left shoulder joint, upper third of the lateral side of the left arm, middle third of the right arm – is indicative of the wide dispersion of the pellets purporting to fix the distance from which the gunshots were fired.

In this context the evidence of the investigating officer P.W. 12 furnishes useful materials to fix the distance of the fatal gunshot firing. He found two pieces of lead were lying on the outer verandah of the deceased close to the wall; one lead piece was stained with lime and the other with green colour, which is wood paint, as it appeared to him, the wooden frame of the Jaffrey put on the verandah of the deceased was white washed with lime; M.Os. III and IV were the two pieces of lead, the two pieces of wads M.Os. VIII and IX were lying on the step to the outer verandah of the deceased; M.Os. III and VIII and IX were sealed in the presence of witnesses under the seizure list Ext. 24. The investigating officer also found three pieces of lead M.Os. V, VI and VII lying on the outer verandah of the house of P.W. 10, Pravakar and close to the wall on the verandah, a piece of was M.O. X was lying on the step to the outer verandah of P.W. 10, Pravakar; M.Os. V, VI, VII and X were seized in the presence of witnesses under the seizure list Ext. 25. The investigating officer also found a small hole in the bottom part of the wooden frame of the Jaffrey put on the verandah of the deceased; cut and seized that part of the wooden frame which is M.O. XXII. Further he found two small holes on the outer side of the wall of the deceased that stands on the outer verandah; similarly he found two small holes on the wooden frame of the Jaffrey put on the verandah of P.W. 10, Pravakar standing on his outer verandah. These small holes on wooden frames and on the walls indicate marks of violence by gunshots. The investigating officer cut and seized bottom parts of the wooden frame of the Jaffrey of P.W. 10, Pravakar containing the hole and these are M.Os. XX and XXI, he seized the cut pieces of wood M.Os. XI, XII and XIII in the presence of the witnesses under the seizure list Ext. 26.

The significance of all these seizures made by the investigating officer read with the medical evidence of five gunshot wounds on different parts of the body is that it shows that fatal gunshots were fired from such a distance as it is consistent with the width of the *Rasta* between the step of the deceased's house where the deceased was hit with the bullet and the road side wall of the house of accused Kamraj.

The question of the distance of gunshot firing is considered from the point of view of certain recognised medico-legal principles, namely these. When a firearm is discharged from a distance, there will to total absence of the characteristics of a 'near' discharge; ingraining of unburnt particles of powder is absent if fired from beyond ten feet; at a distance of twelve to fifteen feet, there is an absence of a main wound as all the pellets enter individually covering an area of about ten inches in diameter; at this distance the pattern formed by the entering shot will consist of small groups at a distance of thirty feet all the shots enter as individual pellets without any grouping and cover an area of about twenty inches in distance; these examples must of course be considered as a general guide in determining the distance at which the weapon was discharged; there are so many circumstances to be considered such as, length of barrel, choke or cylinder, black or smokeless powder, size of shots, (*Cox's Medico- Legal Court Companion*, 4th Edition p 33).

Considering the evidence in the present case in the light of the medico-legal principles, it is abundantly clear – from the manner the pellets from the gunshots dispersed widely all around

– that the gunshots were fired from a distance more than thirty feet, namely, thirty feet, which is the distance of the accused Kamraj's road-side wall from the step of the deceased's house where the deceased was hit with bullets – pellets scattered or dispersed all around. The dispersal of the pellets speaks for itself about the distance.

In the ultimate analysis the question arises: Is the circumstantial evidence sufficiently strong to support the order of conviction under section 302/34 in this case? The position in law as settled by the Supreme Court is in substance this: Where there is no eye-witness to the murder and the case against the accused depends entirely on circumstantial evidence, the standard of proof required to convict the accused on such evidence is that the circumstances should be so far complete as not to leave any reasonable ground for conclusion consistent with innocence of the accused. It is true that in a case of circumstantial evidence not only should the various links in the chain of evidence be clearly established, but the completed chain must be such as to rule out a reasonable likelihood of the innocence of the accused. But in a case where the various links have been satisfactorily made out and the circumstances point to the accused as the probable assistant, with reasonable definiteness and in proximity to the deceased as regards time and situation, and he offers no explanation, which, if accepted though not proved, would afford a reasonable basis for conclusion on the entire case consistent with his innocence, such absence of explanation or false explanation would itself be an additional link, which completes the chain.

8.21.28 Injury-Firearm Linkage[74]

A faint attempt was made by Mr. Ray that the prosecution has failed to establish that the gunshot injuries on the deceased were from the gun (M.O. II). The contention is frivolous and was rightly abandoned later on. It is the common case of the parties that there was only one gun at the time of occurrence and that gun belonged to and was held by accused No. 1 on the spot. The finding being that the deceased died as a result of gunshot injuries, it was not necessary for the prosecution to further establish that the injuries caused by gunshot were from the gun (M.O. II). The conclusion that the gunshot was through M.O. II is irresistible on the common case of the parties and no further proof is necessary as is required in some cases of gunshots.

8.21.29 Identification of Firearm Injuries[75]

The trial court seems to have overlooked this statement and confined itself to the less specific statement of Ajit Singh given at the trial. The fact remains that at the earliest, in the committal court, the appellant clearly alleged that Baldev Singh had been killed with a *sua* by the complainant party. This version was put to Dr. H.C. Gupta, who had performed the autopsy of Baldev Singh, in cross-examination, even in the committal court. The doctor replied that he could not rule out the possibility of these injuries having been caused with a *sua*. This opinion was not discussed by the trial court. The learned judges of the High Court also did not advert to it. Although in examination-in-chief, the doctor had said that these injuries were 'likely to be caused by a firearm', the circumstances on record definitely point towards the conclusion that the injury was probably caused with a sharp-pointed weapon and not with a gun. The injuries were triangular. The dimensions as noted by the doctor were:

(i) three-fourth" x one-second" x three-fourth" on the front of the neck in the mid-line about 11/2" below the chin;

(ii) Lacerated wound 1" x one-second" x one-third" on the back of the neck about 1" below the hair line.

74. *Paramananda Mahakud v State of Orissa*, ILR (1969) Cut 53 : 1970 Cr LJ 931 (HC).
75. *Bhoor Singh v State of Punjab*, AIR 1974 SC 1256 : (1974) 4 SCC 754 : 1974 Cr LJ 929 (SC).

A gunshot wound of entry caused by a single pellet or ball is ordinarily circular or oval in shape. If these injuries were the result of a gunshot fired from close range, with all the pellets piercing *en masse* through the neck, there should have been scorching, blackening and tattooing in and around the wound of entry. The wadding, or round cardboard pieces or pellets should have been found inside or outside the wound near the body. Nothing of this kind was found. Furthermore, the very story of Ajit Singh firing at Isher Singh, but instead hitting his own brother was improbable. According to the prosecution, Isher Singh was then interlocked in a struggle with Baldev Singh. If that was so, there should have been some gunshot injury on Isher Singh. But the doctor did not find any such injury on him.

The above negative and positive circumstances are tell-tale. Taken in conjunction with the doctor's opinion given in cross-examination, they probabilise the defence version that the injuries to Baldev Singh were caused with a sharp pointed weapon – and not with a firearm – by the complainant party.

We have, therefore, no hesitation in holding that the learned judges of the High Court were in error in upholding the conviction of the appellants for the murder of Baldev Singh, merely, on the basis, of what they termed "plausible explanation" rather than positive and convicting proof given by the prosecution. We would therefore, set aside that conviction.[1]

8.21.30 Firearm examination[76]

The recovered pistol had been sent to FSL Rohini for examination along with the cartridges and cartridge cases and one metallic piece recovered from the body of the deceased at the time of post-mortem. The Senior Scientific Officer has proved the Ballistic Report and has proved that the pistol was the same which had been examined by him as F1 and the cartridges were the same which had been sent to him for examination. He has also identified the test fired bullets and the cartridges which were sent to him for examination and the test fired cartridges. The witness has further proved that the improvised pistol was a firearm and the cartridges, cartridge cases, fragment of jacket of bullet and bullet were ammunition as defined in Arms Act. He has conclusively proved that the cartridge cases which had been recovered from the pistol had been fired through the improvised pistol which he has opined since the individual characteristics of firing pin marks and breech face marks present on the said cartridges were found identical when compared with the test fire cartridges under microscope examination. Further, the ballistic report in respect of the swabs of the accused shows that gunshot residue particles (GSR) were detected around the hole on the half sleeves shirt (belonging to the injured). However, no opinion could be given on the swabs due to insufficient data. Therefore, under these circumstances, the prosecution has been able to establish that two bullets had been fired from the pistol snatched from the hand of the accused.

Thus, it is fairly established by the testimony the Senior Scientific Officer-cum-Ex-Officio Chemical Examiner GNCTD FSL Rohini that the death of the deceased and the injury of the injured was a result of the bullets fired upon them by the appellant by use of the same firearm which was recovered. The bullet recovered from the seized pistol and that retrieved from the body of the deceased are of the same origin and fired from the seized pistol, as established by the ballistic reports led in evidence by the prosecution.

In *Prabhu Dayal v State of Rajasthan*[77], the misfired cartridge, the fired cartridge, and the country made pistols were subjected to the examination of the Forensic Science Laboratory. It was clearly stated in the Forensic Laboratory's Reports that the country made pistol contained

76. *Anil Kumar v State*, 2018 (4) ADR 168
77. *Prabhu Dayal v State of Rajasthan*, Criminal Appeal No, 2324 of 2014, decided on 4 July 2018 (SC).

in packet 'H' was in working order. However, it has a tendency to mis-fire the ammunition. It is also stated that the cartridge found in the very packet was fireworthy ammunition.

The report of the Ballistic Expert further makes it clear that based on stereo and comparison microscopic examination, the 12-bore cartridge case from packet 'G' could have been fired from a 12-bore country made pistol. Hence, it is clear that out of the two pistols seized, one pistol had got a tendency to mis-fire and the other had fire worthy ammunition.

Thus, the reports of the Forensic Science Laboratory fully support the case of the prosecution, inasmuch as it is the evidence of the witnesses that Gopal was fired at by Gyan Singh as well as the appellant herein. Among the shots fired, one of the gunshots was mis-fired. Be that as it may, the fact remains, as mentioned supra, that all the five members including the appellant were members of the unlawful assembly which had the common object of committing the murder of the deceased. Hence, the trial Court and the High Court are justified in convicting the accused having regard to the evidence on record. Accordingly, the appeal before this Court stands dismissed and the sentence of life imprisonment imposed upon the appellant stands confirmed.

8.21.31 Dimensions of Injuries[78]

We reserve for the end of this chapter a clinching piece of evidence which establishes that Tahsildar did not shoot Dudh Nath, inasmuch as we shall show in what follows that the latter was shot with a bullet fired from a .303 bore rifle and not a .500 bore rifle, the only weapon attributed to Tahsildar by the prosecution witnesses. What we call the clinching piece of evidence derives from the medical evidence with regard to Dudh Nath's injury.

This evidence discloses that the wound of entry of the bullet was in front of the abdomen and was one-fourth" x one-fourth" in size, while the wound of exit was on the back and was one-third" x one-third" in size. In the trial court no one paid any attention to the nature of the bullet causing an injury of these dimensions, and everyone seems to have assumed that it was in fact from a .500 bore rifle bullet. We considered this assumption of doubtful validity, hence we heard learned counsel specifically on the point and also consulted Taylor's *Medical Jurisprudence* and Major Julian S. Hatcher's *Fire-Arms Investigation, Identification and Evidence*. Referring to high-velocity bullets Major Hatcher observes at p 202 of his book:

> *The skin wound of entrance always corresponds in size to the diameter of the bullet used. It is very common for the aperture of the entrance to appear smaller than the diameter of the bullet but this is an illusion, since the wound invariably admits a projectile similar to the one which caused it.*

The small appearance is due to elasticity and shrinkage of the skin. It is also a fact that the wound of exit is usually larger than the wound of entrance. But no authority has been cited before us which could suggest that, unlike a wound of entry, the wound of exit can be smaller than the size of the bullet which causes it. During the hearing of the appeal we invited the learned state counsel to produce an expert before us who might give such an opinion, but he was unable to produce one.

Bullets of both .500 and .303 bores were produced before us, and by measurement we found that a .500 bore bullet has a diameter of exactly half-an-inch, while that of a .303 bore bullet is slightly less than one-third of an inch. These measurements, coupled with the expert opinion contained in the above mentioned standard work, leave no room for doubt in our mind that Dudh Nath's injury was caused by a .303 bullet and not by a .500 bullet, and we should like to point out that we are strongly of opinion that if the prosecution case that Tahsildar fired the

78. *Tahsildar Singh v State of Uttar Pradesh*, AIR 1958 All 255 : 1958 Cr LJ 424.

rifle Ex. 1, which is of .500 bore, were true, Dudh Nath's entry and exit wounds would have been larger than that found by the Medico-legal expert. In point of fact, the wounds which were actually found by the Medico-legal expert are typically those caused by a .303 bullet.

This finding would exculpate the appellant of Dudh Nath's murder. Incidentally, for the benefit of subordinate courts we should like to point out that where a particular weapon is stated to be responsible for a certain injury, the witness should be asked to explain whether or not that weapon could cause the injury in question. In the instant case the omission to do this with regard to the injury of Dudh Nath and Karna has led to unnecessary difficulty.

8.21.32 Firearm Injury Frauds[79]

After hearing both sides we are of opinion that the appellant's conviction cannot be sustained. There are several circumstances which throw a doubt with regard to the appellant being the author of the gunshot injury received by the injured, Sansar Singh. *Firstly*, the first information report was lodged after a delay of three days, although it was admitted, that the injured person was conscious throughout after the receipt of the injury. *Secondly*, the gunshot injury was on the back of the victim and in his deposition he did not say that immediately after the receipt of the injury he turned back and saw his assailant. Of course, the courts below have imagined this explanation, which the injured himself had not chosen to put forth. The *Third* circumstance which enhances the suspicion about the identity of the assailant that the victim's statement was recorded by the police under the Code of Criminal Procedure, 17 days after the occurrence and 5 days after his discharge from the hospital. No explanation of these delays is coming forth. The *Fourthly,* circumstance is that an attempt was made by the prosecution to rope in the other two brothers of the appellant who have been acquitted by the High Court. *Fifthly*, the conviction rests mainly on the uncorroborated testimony of the injured. His father (PW 1) who had lodged the report came after the incident and was not an eye-witness of the incident. PWs 3 and 4 who were cited as eye-witnesses in the FIR, did not support the prosecution case at the trial, *Sixthly*, there was past enmity between PW 1 and his son (PW 2) on one side and the appellant and his brothers on the other. The occurrence took place after dusk at about 7.30 pm.

8.21.33 Close-Range Phenomena[80]

The nature of the wounds said to have been inflicted on account of the gun being placed on the chest and fired does not fit in with the allegation. It is true that the doctor was not questioned about it. In fact the doctor made the statement that these wounds were due to the gun being fired by being placed on the chest or from within a range of one yard. We are of opinion that in this the doctor was wrong and probably got misguided on account of the black margins of the wounds. The black margins of wound are never due to the firing of the gun from very close range but are due to something different. Taylor says at p 430 of his *Principles and Practice of Medical Jurisprudence*, vol I, 10th Edition:

> *The edges of the wound commonly show a narrow ring of discolouration due to the removal of a layer of epithelium by the passage of the bullet. The surrounding skin may be scorched or not, and there may be a zone of blackening or peppering with grains of powder, according to the distance from which the weapon was fired.*

And again at p 431:

> *All entrance wounds, if examined, will be found to have a zone of denuded epithelium immediately surrounding the orifice. This is caused by the spin of the bullet and tends to dry and*

79. *Satbir v State of Uttar Pradesh*, AIR 1982 SC 1216 : 1982 SCC (Cri) 132 : 1982 Cr LJ 1734 (2).
80. *Sheo Shanker v State of Uttar Pradesh*, AIR 1953 All 652 : 1953 Cr LJ 1400 : 1953 All LJ 720.

become discoloured shortly after death. It should not be confused with the marks due to powder for it gives no indication of range.

And again at p 441:

The bruised and dark appearance which a gunshot wound sometimes present, even when the weapon is discharged at a distance from the body has led to the supposition that this effect was due to a burn and that the bullet burnt the parts which it touched, but this idea is not correct. The projectile never becomes sufficiently heated to acquire the power of burning.

Of course no scorching of the wounds could have been possible in this case when the victims had several clothes on, even if the firing had been from very close range. And that again shows that the doctor's opinion was due to the existence of black margins and not due to any scorching of the surrounding skin. Again Taylor says at p 430.

We must distinguish between near wounds and far wounds. Usually when a weapon is discharged in contact with or within an inch or so of the body the gases which pass out with the bullet enter the tissues and thereafter expand causing tearing of the skin or clothes very often in the form of a cross or a split. Most of the powder is found inside the tissues, but there may be traces of blackening, burning and tattooing around the entrance hole – if the weapon is discharged at a short distance from the skin the effect of the gases is lost and the entrance wound look like a hole which might be caused by pressing a lead pencil into the tissues. It is rounded with inverted edges and surrounded by a zone of singeing, blackening from the smoke and tattooing from the impaction of small particles of powder in the skin.

The clothes did not show such tearing or splitting. It is, therefore, clear from the condition of the clothes which the victims were wearing that the gun does not appear to have been fired by its being placed on the chest or very close to the chest after the victims had fallen down. The position of the first two wounds on Girdhari is also not very consistent with the position of the gun. It is not expected that he would be lying on the left side when the gun would be so fired.

8.21.34 Near Range Wound[81]

Coming to the 9th and the last reason mentioned above it would be noticed that shirt of the deceased was found to be torn at two places. His *dhoti* was also torn and *kachha* was found torn at some places. It was not Manphool's evidence that Ram Sarup while going with him was wearing torn and tattered clothes. He was, therefore, obliged to give an explanation for their being found torn. The explanation was that while putting Ram Sarup on the bullock cart the clothes got torn. The trial judge found it difficult to swallow this explanation. In our opinion the High Court was wrong in accepting it. In the circumstances of the case the probability of the clothes being torn and especially of the *kachha* in the manner suggested by the prosecution, was not there at all. On the other hand, it was quite legitimate to think that Ram Sarup had a scuffle with his assailant and the clothes got torn in that scuffle. Neither Manphool nor P.Ws. 4 and 5, perhaps, saw the occurrence. It is also clear that the gun was fired by the assailant at Ram Sarup's thigh from a very close range. The muzzle of the gun at the time of fire must not be more than a foot away from the thigh. The doctor who did post-mortem examination found a piece of cardboard torn in four parts and a metallic pellet in the left thigh of Ram Sarup. There was burning of the margins of the wound of entry. The doctor was not quite right in saying that it is due to heat of the bullet or the pellet. And this showed that the gun was fired from a close range. The High Court was also of the same view. The ocular version of the occurrence given by the prosecution witnesses 2, 4 and 5 does not indicate that the gun was fired by the respondent after he had come very close to the deceased.

81. *Bahal Singh v State of Haryana*, AIR 1976 SC 2032 : (1976) 3 SCC 564 : 1976 Cr LJ 1568.

Rather, according to the evidence of Manphool it was fired from a distance of about 1-one-second pondas, *i.e.,* about 7-one-second feet.[1]

8.21.35 Medico-legal Evidence Failure[82]

[**Author's note:** If a shot is fired "***touching the chest"*** or skin, the whole ejecta may enter the body *en masse***.** No blacking/tattooing is observed in some such cases**.** The court should have accepted the eyewitness account; or called a Ballistics expert.]

While we are on the medical evidence it would be appropriate to mention that there was no tattooing or charring on any of the firearm injuries which, according to the doctor, shows that the firing was done from a distance of more than 4 feet. In the First Information Report Bal Kishore has stated that as soon as he, his father and sister, reached the culvert, Subhash "touching the chest" of Ram Sanehi "with the barrel of his gun" said that he shall not leave him alive. Shyam Narain thereupon exhorted Subhash not to delay and fire immediately; Subhash then fired three shots in quick succession, one of which misfired. The trend of the FIR is that Subhash fired the first two shot at Ram Sanehi from a point-blank range, in which event, indisputably, there would have been tattooing and charring around the injuries. Bal Kishore has attempted to offer an explanation that what he meant to say in his complaint was that Subhash trailed his gun "towards', Ram Sanehi's chest and not "on" his chest. This explanation is an after-thought and in the circumstances difficult to accept. Thus, in another important respect, the medical evidence falsifies the case of the prosecution.[2]

8.21.36 Self-Defence or Murder[83]

For ascertaining as to whether or not the shots or missiles, which caused the injuries of Dial Singh deceased and Swaran Kaur, were discharged from the same cartridge, we called and examined Dr. B.R. Sharma, Director of the Forensic Science Laboratory, Chandigarh, in this court, to assist us with his expert opinion.

Dr. B.R. Sharma is definitely of the opinion that the two shots found in the parcel, Exhibit p 1, *i.e.*, one extracted from the wall of Sardul Singh and the other picked up from near of house of P.W. Malagar Singh, had been fired from a 12 bore cartridge of standard L.G. size, while in the case of the third shot found in the parcel, Exhibit p 2, the expert opined that it had been fired from a 12 bore cartridge of L.G. or S.G. size. The reason given by the expert, is, that the two shots found in the parcel, p 1, weighed 4.41 grams and 4.24 grams, and that portions of lead from these shots had probably chipped off. The standard weight of L.G. and S.G. shots, according to the expert is 4.54 grams and 3.54 grams, respectively. The deformation of the two shots indicated that they had been fired from a gun.

As regards the shot found in the parcel, exhibit p 2, the expert stated that it was in a greatly deformed condition and probably some of its lead had chipped off. Its weight was 2.76 grams, which weight was greater than the weight of a shot from any other cartridge of standard specifications than L.G. or S.G. The spherical shape of the undamaged portions of these shots indicated that they were factory-made. In an L.G. cartridge of standard size there are 6 shots, in all, while in an S.G. cartridge of standard size there are 9 shots. The diameters of L.G. and S.G. shots are 0.36" and 0.33", respectively. After examining the pictorial diagrams prepared by Dr. Satish Chandra and Dr. Jatinder Singh about the location of the wounds of Swaran Kaur and Dial Singh deceased, respectively, the expert explained that the shots during their passage

82. *Subhash v State of Uttar Pradesh*, AIR 1976 SC 1924 : (1976) 3 SCC 629 : 1976 Cr LJ 1521.
83. *Mohan Singh and Teja Singh v State of Punjab*, Criminal Appeal No, 414 of 1969 (P&H).
Also see: *Hate Singh Bhagat Singh v State of Madhya Bharat*, AIR 1953 SC 468 : 1953 Cr LJ 1933 (SC) : 1952 MBLR (Cri) 1.

through the body of Dial Singh, had suffered deformation, flattening and expansion by their impact with the bones and because of resistance of the flesh. This explains why the dimensions of two of the wounds on Swaran Kaur were greater in cross-sectional area than those of the entrance wounds found on Dial Singh.

Dr. B.R. Sharma was further asked that if in his opinion the injuries to both the aforesaid persons were caused by shots discharged from the same fire, why then the injuries to Swaran Kaur were at a lower level (just above and near about the knee) than those found on the deceased (which were at the level of the nipple). He replied that

1. *firstly*, the shots had, after entering the body of Dial Singh, deflected downwards. This, according to the witness, was particularly true in the case of injury number 1, the exit wound of which was at a lower level than its entrance wound.
2. *Secondly*, Dial Singh deceased must have instinctively ducked while receiving the shots or at the instant when the shots came out of his body.

It is in the evidence of Joginder Kaur, P.W. 5 that immediately after the gunfire the deceased was seen in a bending position and staggering with his hands placed on his wound towards the doorway of Malagar Singh. It was thus probable that the deceased at the time of receiving the shots, or, at any rate, a split second thereafter when the shots were coming out of his body, had by sheer reflex action dipped.

There is, therefore, nothing unbelievable in the categorical version of the eyewitnesses that Dial Singh and Swaran Kaur were hit by the same gunfire made by Mohan Singh.

Mr. Mahajan contended that the shape of the entrance wounds on the body of Dial Singh was quite circular, which meant that the victim was standing erect when he received those wounds.

This argument is not tenable.

1. *Firstly*, the doctor has noted that the margins of these wounds were irregular, also.
2. *Secondly*, the deceased might have started ducking simultaneously with the impact of the shots and continued doing so when the shots were travelling through his body. Furthermore, the shot which caused injury number 1, while travelling through the body of the deceased, had fractured the rib. It must have, therefore, deflected in its course. Even pictorial diagrams (which may not be very precise) prepared by the doctor, show that the exit wound of this injury was at a somewhat lower level than its entrance wound. This gives some indication that the shots after piercing the body of Dial Singh, travelled in a somewhat downward direction.

It may also be noted that the distance between the deceased and Swaran Kaur at the time of the gunfire has not been fixed with precision. According to Karam Singh, P.W. 4, when the gun was fired he was standing behind Dial Singh deceased at a distance of about 4 Karams and Swaran Kaur was at a distance of one Karam from the witness. P.W. Malagar Singh has also stated that at the crucial moment, Swaran Kaur was standing in the lane towards that side where P.W. Karam Singh, his wife and mother were present.

In the note appended to the site-plan, Exhibit PN, it is mentioned that Swaran Kaur was at point number 3, at a distance of about one Karam from point number 1, where the deceased was hit. This note is obviously wrong. It does not conform to the evidence given by the witnesses at the trial. The distance between points 1 and 3, measured by a scale, is more than one-second". The scale of the site-plan is 10 Karams equal to an inch. If the points 1 and 3 have been marked accurately, the distance of Swaran Kaur at the time of the gunfire from the deceased was about 4 or 5 Karams, *i.e.*, roughly 21 to 30 feet. Thus, even if the deceased had ducked only to a small extent when the shots hit him, then also

the slightly downward direction of the shots coming from the body of Dial Singh could have hit Swaran Kaur in the region of the thigh and roundabout the knee. The effective range of an L.G. cartridge, fired from a 12 bore gun, according to Dr. Sharma is 100 yards. It is in the prosecution case that Mohan Singh had fired at the deceased from a distance of about 4 Karams, *i.e.*, about 22 feet or so. Swaran Kaur, as already discussed, was about 4 Karams behind the deceased. This means, she was about 8 or 9 Karams, *i.e.*, about 50 feet or so, from Mohan Singh appellant, at the time of firing of the shot. The very fact that four of the shots had pierced through the body of the deceased, while lending assurance to the ocular account of the prosecution witnesses with regard to the distance from which the gun was fired, also strengthens the inference that those shots were of a relatively high-powered cartridge, most probably of an L.G. cartridge. Shots of an L.G. cartridge fired from a distance of about 20 or 25 feet could, even after piercing through the body of the deceased, have enough power left in them so as to cause fracture of the femur bone of Swaran Kaur. The circumstance that they did not pierce through the body of Swaran Kaur further shows that their velocity at that time was lower than what it was at the time of hitting Dial Singh.

The story that the deceased was also armed with a pistol which he first fired at Teja Singh but injured Swaran Kaur and then had reloaded the same and was about to fire same at Mohan Singh, does not inspire confidence. It has an aura of improbability. If the deceased had come to assist Karam Singh against Teja Singh and others when Karam Singh, according to the defence allegation, was assaulting Teja Singh, then there is no reason why a shot allegedly fired by the deceased from such a close range failed to find its mark on Teja Singh. It is nobody's case that the deceased or any other person on the complainant side wanted to harm Swaran Kaur who was standing near P.W. Karam Singh. If the shot which hit Swaran Kaur had been fired by the deceased, who was also quite close to Karam Singh – there should have been blackening, tattooing or charring around the wounds of Swaran Kaur. No such blackening, was noticed by Dr. Satish Chander, absence whereof also indicates that the shots which hit Swaran Kaur had been fired from a distance beyond 6 feet.

8.21.37 Onus of proof on State[84]

It is said that after he had covered a few steps and had arrived near the water-hut (pyaoo) the appellant fired three shots at him with his rifle. The three shots after killing him pierced through his body and hit three more persons on the platform, namely, Hari Singh, Rameshwar Singh and Kailash Chandra. They were also badly hurt. This shocking incident was seen by several persons including Chandra Prakash Tewari P.W. 22, Mahesh Chandra P.W. 6, Dudhi Ram P.W. 2, Ganga Das P.W. 3 and Pushkar Singh P.W. 23. All these persons apprehended and disarmed him. Chandra Prakash Tewari, then took the appellant to the police station. There Chandra Prakash Tewari deposited the rifle of the appellant at the police station.

The appellant pleaded not guilty and claimed to be tried. He admitted that on 21-10-77 he had been escorting 14 Down along with rakshaks Bholey Prasad, N.P. Mathew and Mahendra Singh. He and Mahendra Singh happened to be in a compartment at the rear end of the train while the others were in front part of the train. Sri D.N. Misra who happened to be in mufti dress met him and enquired from him as to how many rakshaks were on escort duty in the train. He did not disclose the number of rakshaks on escort duty in the train and this led to an exchange of hot words between them. Sri D.N. Misra felt irked and tried to snatch away his rifle. He asked him not to snatch his rifle. He did not listen to him and continued with his unlawful activity. Apprehending that he might lose the rifle he fired three times in defence of

84. *Gautam Lal v State of Uttar Pradesh*, 1981 Cr LJ 1187 (SC).

his property. The third shot hit D.N. Mishra and he fell down dead on the platform. According to him, nobody arrested him on the platform and he himself surrendered at the police station.

We have heard the learned counsel for the parties at sufficient length and after doing so we are firmly of the view that this appeal must be allowed. We find that the court below has not approached this case from a proper angle with the result that it fell in error and passed a wrong order of conviction against the appellant. It is true that the appellant admitted to have fired upon D.N. Mishra causing fatal injuries to him but this admission on the part of the appellant, in our opinion is not sufficient to fasten the guilt of murder on him. The burden which rests on the prosecution to establish its case beyond a reasonable doubt is neither neutralised nor shifted because the accused pleads the right of private defence. The prosecution must discharge its initial traditional burden to establish the complicity of the accused and not until it does so can the question arise whether the accused has acted in self-defence. This position, though often overlooked, would be easy to understand if it is appreciated that the Civil Law rule of pleadings does not govern the rights of an accused in a criminal trial. Unlike in a civil case it is open to criminal court to find in favour of an accused on a plea not taken up by him and by so doing the court does not invite the charge that it has made out a new case for the accused. The accused can be convicted only when the prosecution succeeds in proving that the incident in question had taken place in the way as alleged by it. The prosecution must stand on its own legs and cannot take advantage of the weakness of the defence. Nor can the court, on its own, make out a new case for the prosecution and convict the accused on that basis. It is now well-established that when the very substratum of the evidence given by the eye-witnesses examined by the prosecution is found to be false, then the only prudent course left to the court is to throw out the prosecution case in its entirety. In the instant case we find that the eye-witnesses examined by the prosecution have not cared to disclose the true picture of the incident. According to the prosecution witnesses the appellant had fired three shots at D.N. Mishra and all these shots hit him. After killing D.N. Mishra these shots pierced through his body and they hit three persons more, namely, Hari Singh, Rameshwar Singh and Kailash Chandra. Hari Singh succumbed to his injuries a few hours later but Rameshwar Singh and Kailash Chandra were lucky to survive. One of the shots had lodged itself in the body of Hari Singh and the same was recovered from his body at the time of post-mortem examination. The court below did not avail of the services of a ballistic expert to get that shot examined. In this court we sent that shot to the ballistic expert for examination and report. The ballistic expert examined and stated before us on oath that he did not find any rifling marks on the shot. He was, therefore, unable to give a definite opinion whether the shot examined by him was a rifle bullet. However, we think that it could not have been a bullet because no rifling marks were found on it. If that is so, then it means that Hari Singh did not die of a rifle shot fired by the appellant. Obviously, therefore, he died of a shot that had been fired by somebody else. The prosecution story that he died of a shot fired by the appellant is, therefore, patently false. The falsity of the prosecution case becomes apparent from another fact also. Rameshwar Singh had received a lacerated gunshot wound 8 cm x 3 cm muscle deep. He was also said to have been injured from the rifle shot fired by the appellant. The ballistics expert examined by us is of the opinion that a rifle bullet cannot cause a lacerated wound measuring 8 cm x 3 cm muscle deep. This opinion of the ballistics expert was not challenged by the prosecution. Thus, from this it again follows that Rameshwar Singh did not receive his gunshot wound from the firing done by the appellant.

8.21.38 Accident or Murder[85]

1. The fourth is that the gun, which the deceased Asghar Ali carried, after having obtained it under unexplained suspicious circumstances was a very defective weapon. According to

85. *Nirbhai Singh v State of Madhya Pradesh*, 1972 Jab LJ 383 : 1972 MPWR 625 : 1972 Cr LJ 1474 (MP).

Nigam, ballistic expert (P.W. 7), it was a 12 bore double barrelled breech loading hammerless gun. Although the normal trigger pull of such a gun is about 6-7 lbs. the trigger pull of this weapon was only 2 lbs. According to the witness:

> *If the cocked gun is thrown on the ground the butt-end giving it a jerk, the gun, Article A, fires automatically. If the barrel of the gun, Article A, is struck with some force with any hard substance, the gun discharges.*
>
> *In cases where the trigger pull is low possibility of accidental discharge is there.*

The expert does not mention regarding its safety catch. When we examined the gun ourselves, we found that though it had a safety catch, it was so jammed that it did not work. There is no evidence to show that the police constable, Asghar Ali, was aware of all these defects and had taken precautions against its accidental discharge. It may well be that he did not know about the defects or may have thought, without properly testing the weapon that the safety catch was on, without realising that it was not on but jammed. Whatever that be, the prosecution has not explained why the deceased was carrying such a gun loaded with cartridges.

8.21.39 Murder not accidental fire[86]

The only question for consideration is whether the evidence on the record could justify the finding of the High Court that the gun went off accidentally, or whether it was fired intentionally to commit the murder of Smt. Tulsa Bai. In this respect the following facts and circumstances have been fully established.

The gun (article 'C') which was recovered from the room of the respondent near the dead body and was taken in police custody, was sent for examination by the ballistic expert (P.W. 10). He has stated that he found the gun in working condition and that its barrel showed signs of discharge. He has also stated the pellets which were recovered from the dead body could have been fired from it.

The above facts and circumstances are themselves quite sufficient to prove, beyond any doubt, that Smt. Tulsa Bai died as a result of gunshot injury from the gun of the respondent and in no other manner.

We have carefully examined the question whether the gun could have been fired in the scuffle to which reference was made by the respondent to Jawahar Lal (P.W. 6) and Ram Narain (P.W. 7). It is important to remember that Smt. Tulsa Bai was unwell and had been administered an injection of chloramine a little while ago. She was lying on her bed. The respondent also gave out that he was unwell and was lying on another bed nearly. It is difficult to understand why he, in that situation, should have thought of going to the field at that hour. Even if he wanted to go to the field, there was no necessity for him to load the muzzle-loading gun inside his room, and to ignore his wife's protests against his going when she was ill and did not want him to go. But apart from this, there are two important facts which completely disprove the theory of accidental firing which was set up by the respondent's counsel in the High Court.

Firstly, we find from the statement of (P.W. 14) that there were two apertures on the posterior fold of the left axilla of the deceased with blackening of the skin around them and the apertures were in the nature of wounds. On internal examination, he found that there was fracture of two ribs of the left side on the back. The two apertures were side by side. If it had been true that the gun went off accidentally during the scuffle with the wife the injuries would not have been on the back of her body but on some such part as could possibly come within the range of the gun during the scuffle. The position of the gunshot injuries, therefore, disproves theory of accidental firing and shows that the shot was fired while Smt. Tulsa Bai was

86. *State of Madhya Pradesh v Digvijay Singh*, AIR 1981 SC 1740 : (1979) 4 SCC 92 : 1981 Cr LJ 1279 (SC).

lying with her back towards the respondent. It is also significant that the doctor was not even asked whether the injury could be caused in a scuffle by accidental firing. On the other hand, we find that the statement of the Medico-legal expert that if the firearm had been discharged very close to the body, the pellets would have entered the body *en masse* causing one wound, and not two apertures side by side, was allowed to go unquestioned.

Secondly, if there had been a scuffle, and if the shot had been fired while Smt. Tulsa Bai was preventing the respondent from going away, her dead body would not have been found lying on the cot, as it has been stated by S.I. Bhanwar Singh that the dead body was lying on the bed as shown in map Ex. P-5.

We are, therefore, satisfied that the High Court misread the evidence in arriving at a completely contrary conclusion. It is true that both Jawahar Lal (P.W. 6) and Ram Narain (P.W. 7) had stated that the respondent told them about accidental firing during a scuffle with his wife, but it was not the respondent's own case during the trial that the gun went off accidentally. On the other hand, he took the plea that he heard the gunshot while he had gone out to answer the call of nature and that it was Jaswant Singh who was responsible for the firing. It was only when the courts did not accept that version, that the respondent's learned counsel thought of turning round and making his contention about accidental firing even though the respondent did not find it possible to set it up as a plea in his defence. The High Court also lost sight of the fact that the story of the scuffle was not corroborated by the evidence on the record, and it erred further in stating, without any reason, that statements of Jawahar Lal and Ram Narain were sufficient to discharge the onus of proving accidental firing. The High Court tried to explain away the incapacity of Smt. Tulsa Bai to have any scuffle with her husband by saying that a stiff opposition need not have been offered by her and that "by touching the gun or any other part of the body of the accused the deceased may have desired the accused not to go to the field". But if there had been some such touching, it could not be called a scuffle and would not have led to the firing of the gun. In this respect also, the High Court misread the evidence on the record. The High Court has stated further that the "position of the injury" also showed that the injury "suffered by the deceased was not intentionally caused by the accused". It has further been stated by the High Court that "if the accused wanted to kill her, it is not likely that he would have caused the injury on the arm near the axilla". The record, however, reads otherwise for as has been pointed out, the position of the injury was at the back and was by itself sufficient to exclude any possibility of accidental firing during the course of a scuffle. It is difficult for us to appreciate what exactly is meant by saying that if the accused wanted to kill his wife, it was not likely that he would have caused the injury on the area near the axilla. The report of P.W. 14 shows that the gun shot caused apertures on the posterior fold of the left axilla and fractured two ribs on the left side of the back. The High Court, therefore, misread the evidence in holding that the injury was caused on the arm near the axilla. What the Medico-legal expert had stated was that he found charring on the left arm, and not that the injury was located there. Moreover, the High Court did not appreciate that even a gunshot injury on the arm or the axilla would have been sufficient to cause death and that, as it happened, the injury on the back did prove fatal.

It may be that the prosecution was not able to prove the motive for the crime, but that could not possibly matter when the circumstantial evidence on the record was sufficient to prove, beyond any doubt, that it was the respondent and no one else who intentionally caused the death of Smt. Tulsa Bai.

8.21.40 Direction of Fire[87]

Mr. Basi Reddy in a forceful argument advanced the theory that the wound inflicted on the body of the deceased could not have been caused, if the first accused took a conscious aim at him. In support of his argument he relied upon the statement made by the eye-witnesses before the committing magistrate to the effect that the first accused wrested the gun from the hands of the second accused. It is said that, in the course of the wresting, the gun must have gone off accidentally and hit the deceased.

Reliance is also placed upon the evidence of the doctor in support of this theory. The doctor, as P.W. 4, says that the wounds Nos. 4 and 5 were exit wounds at the same level and that the deceased must have been shot from within about 10 yards. In cross-examination he further adds that the entry and exit wounds were almost on the same level in line with the first lumber vertebra. But he concedes that it is possible that there was a slight deflection on hitting the vertebra.

The wounds found on the body were described by him as follows:

1. A circular wound 11/2" in diameter (edges inverted) 4" from the umbilicus and 6" from the left nipple in the anterior axillary line (vertically paralleled to nipple line and a little away 11/2" to 2") with a part of the intestine projecting outside the wound.
2. An abrasion 1" diameter leftwards to the first wound.
3. A contusion 3" x 2" around the first wound.
4. Five performed wounds 11/2" in diameter in the right side of the abdomen in the lumbar region 3" above the right iliac crest.
5. A perforated wound 11/4" in diameter in the right arm at the level of the medical condyle in the right humerus.

Relying upon these wounds and the opinion of the doctor, it is contended that when a person shoots another of about the same height from a short distance on the side of abdomen, it is impossible to cause an injury which would cause wounds almost in the same level in line with the lumbar vertebra.

To put it differently, the argument is that, if the first accused shot the deceased on the side of the abdomen, the bullet could not have passed in a straight line from one side to the other but should have passed only in the direction in which the gun was placed, *i.e.*, the wound should have been not in a straight line, but in a slanting direction. The learned advocate also made a demonstration with a gun showing that the trigger could easily be released with a slight pressure. It is true that, the wound might not have been caused in the manner now found on the dead body.

Even then, there is no guarantee that the bullet would pass only in a slanting direction corresponding to the way in which the gun was held, for there might have been a deflection of the bullet when it came into contact with the vertebra. The evidence has not made it clear that the trace of the wound was also in a straight line.

But we do not think it is advisable to speculate on the basis of theoretical considerations. The first accused is 19 years old and the second accused is 65 years old. They were pursuing the deceased. The first accused found his father's hand shaking. He took the gun from him and shot the deceased. The first accused obviously must have been in an emotional state and he could not have had an opportunity at the time to take aim as he would have done in ordinary

87. *Re T Munirathnam Reddi ()*, AIR 1955 AP 118 : 1955 Andh WR 53 : 1955 Cr LJ 917 (SC). Also see *Rama Swami v State of Tamil Nadu*, 1951 (2) Mad LJ 630.

circumstances when he would shoot an animal or bird. In the hurry, he would have taken the gun from his father and released the trigger immediately. It is not possible to say in what position he kept the gun when he released the trigger.

The fact that the witnesses stated that he aimed at the deceased cannot be taken to mean that he aimed at the deceased in the manner he would have done under ordinary circumstances. We cannot, therefore, reject the evidence of the eyewitnesses relying upon some theoretical considerations based upon the nature of the wound. We, therefore, hold that the first accused committed the offence of murder.

8.21.41 Improper Post-mortem Examination[88]

The contention on which considerable emphasis has been laid by the learned counsel for not believing the eyewitnesses is that their evidence is in conflict with the medical evidence. We shall, therefore, advert to the medical evidence at this stage. PW/12 has deposed that he found the following injuries on the dead body of the deceased Gamu:

1. Gunshot wound (wound of entry) 2" x 1", lung deep, in left infra clavicular region, 11/4" lateral to left sternoclavicular joint, charring of margins of wounds, margins inverted, wound directed downwards, backwards, and laterally.
2. Gunshot wound (wound of exit) 31/2" x 11/4", lung deep, middle of left side of the back, 2" lateral to midline at the level of the lower part of the scapula.
3. Lacerated wound one-fourth" x one-fourth" muscle deep, 2" above the wound No. 2. On opening the dead body, it was further found that the 1st and 2nd ribs on the left side were fractured on the anterior side (front) and 5th, 6th and 7th ribs were fractured posteriorly (back). Pleura was ruptured at two places. Fluid blood was present on the left side, about 400 ml. A lacerated wound 2" x 2" through and through in the upper half of the left lung was found and the lungs were collapsed. Left pulmonary vessels were ruptured. The injuries, according to the doctor, were sufficient in the ordinary course of nature to cause death. He recovered 15 pellets from the dead body at the time of post-mortem examination. Out of these pellets, 12 were of small size and three were of big size and a few of them were lying loose in the wounds of the back and others were removed by dissection of skin around the wound on the neck. All were situated within an area of a circle of about 3" diameter from the centre of the wound on the back. In the wound of back, amongst the pellets, a few were of small size and bigger sized ones were also lying there. The edges of injury No. 3 were inverted and irregular. The learned counsel has laid great emphasis on the following portion of the statement of PW. 12 Purushottamdas Vyas:

   On the post-mortem appearance I am of the opinion that the wounds were caused most probably by one shot. But I cannot say definitely because of the fact that the pellets were of two different sizes and I am not expert about the pellets" … "The edges of injury No. 3 were everted and irregular. The edges of injury No. 2 were also everted and irregular. The margins of injury No. 1 were regular and oval shaped and inverted. It is correct that on the body of deceased Gamu there was only one entry of gunshot wound and of that entry there were two exit wounds. Injury No. 3, the exit wound, was probably due to the exit of two pellets. The wound of entry and the exit wound were through and through …

88. *Hussain Khan v State of Rajasthan*, 1976 Cr LJ 821 : 1975 Raj LW 374 : 1975 WLN 585.

> There was no scorching or tattooing around the wound No. 1. The distance of the firearm must have been between 1 to 3 feet from the victim.

There is a three pronged attack of the learned counsel. His contention is that according to the direct evidence there were two fires which hit the deceased whereas according to the medical evidence there was only one entry wound and two exits. Therefore, the direct evidence is believed. Another branch of his argument in this connection is that the gunshot wound in the chest of the deceased caused a big hole which must have resulted in profuse bleeding, but no blood was found from the hut in which the first shot is said to have been fired upto the place where the deceased fell dead on account of the second gunshot in the back. The third branch of his argument is that no wads and pellets were found inside the hut.

It may be pointed out that P.W. 12, was not a very experienced doctor when he had appeared in the witness-box. He passed his M.S. examination in 1971 and had entered in government service on 26 December 1970. This was admittedly the first post-mortem examination he had performed. He is also not definite in his opinion whether the injuries in question were the result of one gunshot or of two gunshots. He has qualified his opinion by stating that the wounds were caused most probably by one shot but he cannot say definitely because of the fact that pellets were of two different sizes. No doubt at another place the witness has stated that there was one entry of gunshot wound and there were two exit wounds and injury No. 3 was probably due to the exit of one or two pellets. The evidence of the doctor, in our opinion, does not exclude the possibility of there being two gunshots which may have struck the deceased. Maybe, that the second gunshot alleged to have been fired from behind by the assailant while the deceased was running, was not effective. On the basis of indefinite opinion of the medical expert as in the present case, we are not prepared to reject the direct evidence.

The learned public prosecutor has also urged that most of the pellets of the second gunfire may not have hit the victim on account of wide dispersion and the eye-witnesses may have thought that the second, shot hit the back of the deceased. The explanation furnished by the learned public prosecutor cannot be said to be altogether devoid of force.

In *Mohanlal v State of Rajasthan*,[89] it was observed that:—

> *There is always a tendency to over-emphasize discrepancies between the evidence of eye-witnesses and medical testimony. These discrepancies should be treated and appraised just like other discrepancies in the statements of the witnesses. It cannot be forgotten that the eye-witnesses may not give a very correct and accurate account of the version and may at places make exaggerations or may fail to give correct facts either on account of lapse of memory or on account of inability to observe minutely or to recite correctly. It should also be borne in mind that sometimes the Medico-legal experts also do not bestow sufficient care while performing examinations and their opinions may not be properly formed on account of inadequate or defective examinations or lack of complete knowledge. It is, therefore, hardly fair to expect a complete and perfect correspondence between the medical evidence and the eye-witness testimony. Naturally, therefore, the court may carefully examine the discrepancies and if it is reasonably open to arrive at a substantial and true version of the prosecution case, the courts should not adopt the easy course of throwing away the prosecution case on the alleged discrepancies between the medical evidence and the eye-witness testimony.*

In *Nankhusingh v State of Bihar,*[90] their lordships of the Supreme Court observed as follows:

> *When a person fires at a place where there are two persons, one witness may think that it is fired at one person and the others may think that it was fired at the other. Merely because the*

89. 1960 Raj LW 565 : (1961) 1 Cr LJ 155.
90. AIR 1973 SC 491 : 1972 Cr LJ 1204 : 1972 SCD 793.

> *inference drawn by one witness which may not fit in with the inference drawn by the other the factum of the firing at the place where the injured persons were, cannot be rejected. It cannot be held that the witness is a liar and he wanted to falsely implicate the appellant and others.*

Again in *Nihal Singh v State of Punjab,*[91] an argument regarding contradiction between medical evidence and direct evidence was repelled by their lordships of the Supreme Court in this way:

> *Another fact relied upon by the learned additional sessions judge in discrediting the eye-witnesses is that the witnesses stated that the deceased gave a Takwa blow on the head of Nihal Singh, but the medical examination showed only a small abrasion on his left thumb. The High Court explained that the witnesses must be describing only the movements of the accused with their weapons and they could not obviously give evidence as to where a particular weapon hit the body, for that would depend upon not only the manner in which the person wielded their weapons but also on the movement of the victim. A hit aimed at the head may, if the victim moves aside, miss altogether the body of the victim or fall on a part of his body different from that aimed at. There is certainly force in what the High Court said.*

Applying the reasoning adopted by their lordships of the Supreme Court in the cases cited above, the so-called contradiction or conflict between medical evidence and direct evidence pointed out by the learned counsel in the present case is, in our opinion, clearly explicable. Maybe, that the second shot did not hit the victim and the witnesses may have got an impression that the shot hit the victim on the back. Maybe, that only a few pellets of the second shot hit the victim and the rest went amiss. In our opinion, nothing turns upon this so-called contradiction or conflict between medical evidence and direct evidence.

In respect of P.W. 5, Smt. Jannat's statement, the learned counsel has drawn our attention to another discrepancy and it is this that Smt. Jannat states that the victim was at a distance of about one pace (roughly five feet) from the muzzle, whereas according to P.W. 3, Khanu, the accused fired the gunshot which hit Gamu from a distance of about six to seven paces. In our opinion, nothing substantially turns upon the discrepancy in the distance.

In *Janak Singh v State of Uttar Pradesh,*[92] their lordships of the Supreme Court observed as follows:

> *According to Dr. Ghosh's evidence, none of the three entry wounds showed any blackening or tattooing. Obviously, therefore, the firing did not take place from a very close range but from some distance at least. No doubt, the three eye-witnesses gave different distance ranging from two to six paces. But they could hardly be expected to have marked at the time the precise distance at which the person shooting the firearm was. They, therefore, gave an estimate of the distance at which he was from the victim. It is a wonder that the distances they deposed varied. Nothing can, therefore, turn on such variation.*

In this connection, the learned counsel has laid much emphasis on the fact that no blood marks were found either in the hut, where the first shot is alleged to have been fired, or outside the hut upto the place where the victim fell after the alleged second shot. The learned counsel has argued that looking at the size of the wound caused by the first shot, there must have been profuse bleeding and some blood must have fallen on the ground. But since there is no evidence that there was any blood either in the hut or on the way, the direct evidence is false. In our opinion, the argument, though it appears attractive, has no substance. We have it in the evidence that due to winter season the deceased was putting on a shirt and a woollen coat. Further, he had pressed the wound while running, with both of his hands. The clothes of the victim were found soaked with blood and it is quite possible that no such quantity of

91. AIR 1965 SC 26 : (1964) 4 SCR 5 : (1965) 1 Cr LJ 105.
92. AIR 1972 SC 1853 : (1973) 3 SCC 50 : 1972 Cr LJ 1177.

blood may have fallen either in the hut or on the way as may be collected for the purpose of investigation. A lot of blood spread out at the place where the victim fell. It is also possible that the man might have bled internally after receiving the first gunshot wound. Thus, in our opinion, the absence of blood marks in the hut or on the way is sufficiently explained.[1]

8.21.42 Number of Firearms[93]

Dr. SC Pandiya who performed the post-mortem examination has described in his evidence the injuries received by Ram Sanehi. In all he found 7 injuries on the dead body out of which injuries 1, 3 and 7, injuries 2 and 4, and injuries 5 and 6 are interconnected. Injury No. 1 is described as a "shot wound" with its entry above the left nipple. Injury No. 3 is described as multiple rounded abrasions on the left side of the chest. Injury No. 7 is the wound of exit on the right scapular region, corresponding to injury No. 1. Injury No. 2 consists of 8 gunshot wounds of entry below the right nipple while injury No. 4 consists of multiple rounded abrasions above the right nipple. Injury No. 5 is a gunshot wound of entry on the back of the left forearm while injury No. 6 is the corresponding wound of exit near the ulnar aspect of the left forearm.

The evidence of Dr. Pandiya and the description of the injuries given by him in the post-mortem report tend to show that two different kinds of firearms were used by the assailants of Ram Sanehi. Injury No. 1 was caused by a bullet and that is clear not only from the description of the injury but from what Dr. Pandiya has stated in his evidence. He says: "The bullet, which had entered through injury No. 1 went out straight after an emergency from injury No. 7". Injuries Nos. 2 and 5 were caused by pellets. This shows that whereas injury No. 1 was caused by a firearm of the nature of a rifle, injuries 2 and 5 were caused by an ordinary gun. The medical evidence thus falsifies the eyewitnesses' account according to which, the appellant Subhash alone was armed with double-barrelled gun, the other appellant Shyam Narain being armed with a lathi. The objective inference arising from the nature of injuries received by the deceased has a significant impact on the prosecution, which has been overlooked by both the sessions court and the High Court.[1]

8.21.43 Number of Shots[94]

1. The total number of used cartridges which were recovered from the scene of offence were five.

The Ballistic Expert has expressed his opinion that all the five cartridges were fired from the rifle which was seized from the appellant.

Having given our anxious consideration to this submission urged by learned counsel for the appellant we are unable to accede to it. Having regard to the fact that the appellant had used a dangerous weapon like a rifle (being a police constable he must have known that it was a dangerous weapon) and having regard to the fact that he had fired at Kaptan Singh as many as five shots, one of which was fired after Kaptan Singh was hit by a bullet and collapsed on the ground, it is impossible to accept the contention that the appellant had not done the act with the intention of causing his death. It is naive to argue that the intention was merely to frighten him or to cause grievous hurt for it overlooks the two salient features *viz*. (1) as many as five shots were fired from his 303 rifle; and (2) that he fired a shot even after Kaptan Singh had collapsed on the ground having been hit by one of the shots.

2. As we did not find ourselves in agreement with the above opinion in some of its aspects, especially that covering the type of projectile which caused injury No. 5, we had the entire

93. *Subhash v State of Uttar Pradesh*, AIR 1976 SC 1924 : (1976) 3 SCC 629 : 1976 Cr LJ 1521.
94. *Om Prakash v State of Haryana*, AIR 1971 SC 1388 : 1971 All Cri rule 368 : 1971 Cr LJ 1109 (SC).

matter examined by Dr. B.R. Sharma, Director, Forensic Science Laboratory, Chandigarh, to whom gun Exhibit p 3 and the projectiles recovered from the dead body were made over for observation and opinion, he being a ballistic expert who was examined as C.W. 1. He was of the view that injuries Nos. 1 to 4 could have been caused by a single shot fired from gun Exhibit p 3 and that injury No. 5 could have resulted from another shot discharged from the same gun. He was subjected by Mr. Sibal to a lengthy and searching cross-examination during the course of which he made the following points:

1. Injuries Nos. 1 to 4 could have been caused thus. The shot was fired from a distance of about 3 to 8 feet. The left shoulder of the victim was nearest to the muzzle of the gun and his head and face were turned towards the left. Three of the pellets caused injury No. 4. Two of them and the wads caused injury No. 1 and a single pellet resulted in injuries Nos. 2 and 3.
2. Injury No. 5 was caused by a shot from a distance of 2 to 5 feet, so that the charge entered *en masse*, although the whole of it was not recovered from a dead body. Tattooing and blackening should have been present in the case of this injury. The opinion of doctor (P.W. 2) that this injury was caused by a projectile having a diameter of about 1", is not correct.
3. In the case of both the shots, the ammunition used could have consisted of L.G. cartridges.
4. Charring is more often than not confused with the deposit of dirt around the wound or with contusions caused by the impact of the projectile. Tattooing would be observed in the case of a wound caused by a shot fired from a distance upto 8 feet.
5. Injuries Nos. 1 to 4 could not have been caused by a shot fired from a distance of "within 2 feet". This opinion is based on the impossibility of injuries Nos. 2 and 3 having been caused by a separate shot.
6. In the case of injury No. 4, the pellets skipped. If they had entered the body at the seat of the injury, the damage caused would have been extensive. On the left shoulder part of the shirt of the deceased were observed five holes, three of which indicated entrance of the pellets and two their exit, two of the former being in line with the latter and fifth one being very small in size with its location just above the other two entrance holes.
7. The phial said to contain the small pellet recovered from one of the wounds comprised in injury No. 4 had inside it only pieces of dried blood and no pellet.

The science of ballistics on which the testimony of Dr. Sharma (C.W. 1) is mostly based attaches quite some importance to the factors determining the distance from which a firearm causing a particular injury was probably discharged and we think it only right to take note at this stage of standard treatises on the subject. Reference may be made with advantage to the following passages appearing at pp 236 and 237 of Modi's *Medical Jurisprudence and Toxicology* (1969 Edn.):

The effects produced by small shot fired from a shotgun vary according to the distance of the weapon from the body, and choking device. A charge of small shot, fired very close to, or within a few inches, of the body enters in one mass like a single bullet making a large irregular wound with scorched and contused edges, and is followed by the gases of the discharge which greatly lacerate and rupture the deeper tissues. Particles of unburnt powder expelled from the weapon behind the missile are driven to some distance, through the wound, and some of them are found embedded in the wound and the surrounding skin which is also singed and blackened by the flame and smoke of combustion. The exit wound of a close range shot shows greater damage of tissues than the entrance

wound, the margins are everted, but there is no evidence of blackening or singeing. At a distance of one to three feet small shot makes a single aperture with irregular and lacerated edges corresponding in size to the bore of the muzzle of the gun, as the shots enter as one mass, but are scattered after entering the wound and cause great damage to the internal tissues. The skin surrounding the wounds is blackened, scorched and tattooed, with unconsumed grains of powder. On the other hand, at a distance of six feet the central aperture is surrounded by separate openings in an area of about two inches in diameter made by a few pellets of the shot which spread out before reaching the mark. The skin surrounding the aperture is not blackened or scorched, but is tattooed to some extent. At a distance of twelve feet the charge of shot spreads widely and enters the body as individual pellets producing separate openings in an area of five to eight inches in diameter, but without causing blackening, scorching or tattooing of the surrounding skin. At a distance of about 50 feet a pattern measuring about 14 inches from a fully choked barrel and about 28 inches from an unchoked barrel are produced and at about 100 feet the spread pattern on the target is about 30 inches from the fully choked barrel and 50 inches from an unchoked one. The scattering of the shot depends upon the size of the gun, the charge of the powder and the distance of the gun from the body. As the distance increases, the damage caused by a single pellet diminishes.

* * * * *

If over shot card wad is found in the wound it indicates that the shot was fired from less than two yards while its absence suggests more than two yards.

In conclusion it must be noted that it is not easy to give a definite opinion about the distance from which a firearm was discharged. According to *Taylor's Principles and Practice of Medical Jurisprudence* (Ed. X, Vol I,) p 441, no general rule can be laid down.

This is what John Glaister says on the subject at pp 244 to 247 of his work of the same name (1962 Edition):

These weapons have for their projectile, collections of small shot which vary in size, depending upon the type of cartridges employed. The small shot or lead pellets are held in position by wads, one placed between the powder and shot charges, the other on the top of the shot charge, and held in position by the end of the stout paper cartridge case turned over against it. After firing, the pellets disperse soon after their exit from the barrel, and this dispersion increases with the range. The degree of dispersion can be controlled to some extent by a 'choking' device near the termination of the barrel. This takes the form of a slight construction which varies in degree in different weapons. To describe this, such terms as 'full choke' and 'half choke' are used. In certain weapons there is no 'choke' device. If a shot is fired close to the body surface, up to a few inches, the shot enters as en masse, and in addition the liberated gases and flame lacerate the tissues, which show evidence of burning, carbon deposit, and powder tattooing. The wads may be forced into the wound, and this may prove an important clue to the class of cartridge used. When the gun has been fired at from 1 to 3 feet from the body, a more or less irregularly circular wound about 1½ to 2 inches in diameter will be produced.

There will be evidence of some degree of the scorching, carbon deposit, and tattooing. So far as dispersion is concerned, with a 'half-choke' gun the pellets will show a spread of about 5 inches in diameter at a range of 5 yards, about 12 inches in diameter at 10 yards, about 16 inches in diameter at 15 yards, and about 20 inches in diameter at 20 yards. To determine the dispersion at the same ranges with a gun of 'full choke' an approximate method is to deduct a quarter from the measurements of these diameters of spread. At a range of over a yard and up to about 3 yards, evidence of burning disappears and probably only faint tattooing will be found. Beyond a yard, the entering shot produces an irregular wound, and, as the result of commencing dispersion of the pellets, individual pellet holes may be detected.

When the smokeless powder is used, blackening and tattooing will be less marked at all ranges than with black powder.

Accurate estimations of the pellet patterns at different ranges are not possible, since so much depends upon the idiosyncrasies of individual cartridges. This is due to the fact that the cardboard wad is so frequently dislodged in an oblique fashion that turbulence of the shot occurs within the barrel and thus affects the pellet patterns at other than close ranges. With regard to the size of the area of wounding produced by a sporting gun, almost irrespective of choke, an approximate estimate, at different ranges, may be obtained by using this simple formula:

If X = range in yards, then the diameter of the wounds = (X+1) inches.

It should be clearly understood, however, that the dimension of the area of wounding, as calculated in the foregoing, is that of the cone of the shot spread, measured on a plane perpendicular to the line of fire and upon a relatively flat surface.

Taylor in his famous work entitled "*Principles and Practice of Medical Jurisprudence*" (1965 Edn.), states at p 283:

Shotguns fire a charge of lead pellets which, if fired from a full 'choked' (narrowed) cylinder spread to a pattern which, measured in inches, is about the same as the distance in yards.

And again at p 295—

As the amount of 'choke' or narrowing of the bore is of importance in keeping a shot charge together, it is vital to know which barrel has been fired. Discharges from unchoked barrels may begin to spread at 2 or 3 feet from half-choke at 3 or 4 and full-choke at 5 or 6 feet.

At p 296 he adds—

Whatever the nature of the charge or projectile, a portion of the powder always escaped combustion at the time of discharge and each grain then acts like a minute projectile, contusing the skin, producing ecchymosis and often lacerating it if the weapon is fired at a close range. The clothing may be burnt, and the skin scorched by the flame of hot gas, and particles of powder may be actually driven into the skin causing 'tattooing'. Powder marks are more easily seen when the older black powder is used. Smokeless powders are more completely burnt, and leave, as a rule, less deposit. The grains being colourless are less easily detected, and may entirely escape observation unless a hand lens is used. We may assume that marks of burning, or blackening, or of tattooing from powder indicate that the weapon was fired from a near distance, certainly within arm's reach.

All the three authors above quoted appear to unanimous that in judging the distance from which a firearm was discharged, the appearance and nature of the resultant wound cannot be said to afford a sure criterion and that any deductions based thereon would lead at best to a very rough estimate.

We have given our most careful consideration to the medical evidence in the light of the above quoted authorities on medical jurisprudence, the deposition of Dr. B.R. Sharma and the contention of Mr. Sibal and our conclusion is that the latter cannot prevail and that the opinion of the ballistic expert, substantially in accord as it is with the said authorities, deserves acceptance. It is true that if the edges of the wound covered by injury No. 2 were found charred, that injury could not have been caused by the same shot from which resulted injuries Nos. 1 and 4, these two injuries, according to Dr. Sharma, having been the result of fire from a range of 3 to 8 feet. It must be held, however, that it was the contusing effect of the impact of the projectile or the dirt ring around the wound covered by injury No. 2 that was mistaken for charring; for, as pointed out by Dr. B.R. Sharma (C.W. 1), injuries Nos. 2 and 3 could not have been caused by a separate shot inasmuch as such a shot would have produced a larger entrance wound and should also have resulted in more than one exit wounds. The dimensions of the wounds covered by injuries Nos. 2 and 3 unmistakably indicate that these wounds were caused most probably by a single pellet and such a pellet would properly be relatable to the shot which caused injury No. 1. In this connection reference may be made not only to the proximity to

each other of injuries Nos. 1 and 2 but also to the fact that only two pellets were recovered from inside the head of the deceased, a fact indicative of the rest of the charge from the shot not having gone into the entrance wound covered by injury No. 1, even though the wads were all recovered from the occipital region. These factors, about the existence of which there can be no doubt, show that the charge did not enter *en masse* but had spread to some extent at the stage of impact and are incompatible with the existence of charring in the case of injury No. 2.

It further clearly appears that the "small pellet" which the doctor (P.W. 2) claims to have found embedded in the centre of the three wounds comprising injury No. 4 was nothing more than dried blood and all the pellets which had caused these wounds had skipped the shoulder. This follows not only from the fact that only pieces of dried blood (and no pellet) are contained in the relevant phial but also from the relative position of the wounds on the shoulder part of the shirt of the deceased. And if this be so, it cannot be said that the pellets, which caused the three wounds just above-mentioned had lost most of their momentum by the time they struck the deceased and had, therefore, been fired from long range.

And once this conclusion is reached and the charring part of injury No. 2 is ignored, no improbability attaches to injuries Nos. 1 to 4 having resulted from a single shot. If the ammunition used by the assailant was an L.G. cartridge and the victim's face was turned towards the left, his shoulder being the part of the body nearest to the muzzle of the gun, part of the charge (three pellets) could well have grazed the shoulder and ran past it through the shirt, another pellet could have gone into the left cheek and out at the seat of injury No. 1 along with the wads, breaking the jaw and getting lodged, after deflection, in the occipital region; so that in such a situation injuries Nos. 1 to 4 would be just the injuries that would result.

Insofar as injury No. 5 is concerned, we have not the slightest hesitation in holding that the doctor's opinion about the diameter of the missile which caused it being an inch or so, is wholly unreliable; nor has Mr. Sibal been able to give us the description of any weapon from which such a missile was likely, in the circumstances of the case, to have been discharged. On the other hand, as pointed out by Dr. B.R. Sharma (C.W. 1), the injury could have been caused by fire from a shotgun, the range being such that the charge would enter *en masse.* It is no doubt true that according to Dr. Sharma, the injury should have been marked by tattooing and blackening. But then we are not very sure if the doctor (P.W. 2) conducted the autopsy with such care as not to have missed noticing tattooing and blackening in the case of injury No. 5 if it was actually there; nor are we convinced that tattooing or blackening was really present in the case of injury No. 5 such as may have been capable of detection by the naked eye. As pointed out above in one of the passages cited from Taylor's work, marks left by unburnt smokeless powder which is colourless are less easily detected "and may entirely escape observation unless a hand lens is used". It has also to be borne in mind that the charge would enter *en masse* and produce a wound of the type of injury No. 5 even if the shot causing it is fired from a range of about 6 feet provided the barrel used is a full-choke barrel and in such a case the chances of the presence of detectable tattooing may not be very bright. In this view of the matter we hold that injury No. 5 could well have been caused by a charge proceeding from a shotgun and that the recovery of only a single pellet such as could have formed part of that charge from inside the body of the deceased is attributable only to the autopsy being not as thorough as it should have been.[1]

8.21.44 Carrying Gun[95]

Though both the courts found on facts that the petitioner has committed an offence under section 27 of the Arms Act, I am unable to agree with the same. It is very doubtful whether the

95. Re *SS Sundaram (),* 1975 Mad LW (Cri) 6 : 1975 Cr LJ 1196 (Mad).

petitioner was armed with a gun at all the time of the occurrence. The petitioner has clearly stated in his statement that there was a wordy quarrel at the time of the alleged occurrence and that P.W. 1 had falsely implicated him as if he was armed with a gun and attempted to shoot him. One clinching circumstance rendering the version of the revision petitioner probable is that if he really had a weapon, P.Ws. 1 and 2 who claimed to have over-powered the petitioner when he was alleged to have attempted to use the gun, could have seized the gun also. P.Ws. 1 and 2 would not have allowed the petitioner to go away with the gun when they would say that they had over-powered him. The gun was seized subsequently only from the house of the revision petitioner. I am unable to accept the evidence of P.Ws. 1 and 2 in this case that the petitioner was armed with the gun at the time of the incident. On this point alone, the petitioner will be entitled to an acquittal.

Even assuming that he had a gun at the time of the occurrence, since both the courts found that he had not used the gun, it cannot be said that he was carrying the gun with the intention of using the same for an unlawful purpose. When the purpose for which the gun was said to be used is negatived, the question that the gun was taken with the intention of using it for an unlawful purpose does not arise. Therefore, the conviction and sentence imposed on the petitioner are set aside.[1]

8.21.45 Dispersal of Shots[96]

1. The third contention was the one which Mr. Dixit elaborated. His proposition was that the medical testimony contradicted the eye-witnesses' version and that contradiction rendered their account unacceptable. According to Dr. Ghosh's evidence, none of the three entry wounds showed any blackening or tattooing. Obviously, therefore, the firing did not take place from a very close range but from some distance at least. No doubt, the three eyewitnesses gave different distance ranging from two to six paces. But they could hardly be expected to have marked at the time the precise distance at which the person shooting the firearm was. They, therefore, gave an estimate of the distance at which he was from the victim. It is a wonder that the distances they deposed varied. Nothing can, therefore, turn on such variation.

2. But counsel pointed out that injury No. 1 showed six entry wounds in the left back, injury No. 5, four such entry wounds in the thigh and injury No. 7 in the left leg, one such entry wound. According to him, therefore, eleven pellets had actually hit various parts of the deceased's body, which fact must indicate the extent of dispersal of the shot. He suggested that considering the area of dispersal the shot could not be single shot as deposed by witnesses, and secondly, that it could not have been fired from a short distance also deposed by them. In particular, he relied on the observation by the trial court that an S.G. cartridge contains nine pellets only and, therefore, the fact that the three entry wounds were caused by eleven pellets clearly suggested that there must have been at least two shots fired and not one. He also emphasised that the area of dispersal from the victim's back to her left leg also suggested that it could not have been one but two shots which could have caused all the three entry wounds with eleven pellets having caused eleven injuries at three different places. In support of his theory, he relied on the finding by the police (Ex. Ka 10) of five tiklis of cardboard and one flattened round shot at the well which according to him was again indicative of more than one shot having been fired at. It is clear that the entire argument was based on the assumption of a wide dispersal of the shot.

The facts of the case and the evidence on record, however, do not support the assumption. The three entry wounds, besides the account given by the eye-witnesses, clearly established that the deceased was shot in her back from behind. If she was sitting, as described by the eye-

96. *Janak Singh v State of Uttar Pradesh*, AIR 1972 SC 1853 : (1973) 3 SCC 50 : 1972 Cr LJ 1177.

witnesses, in a crouched position, her back, her left thigh and her left leg would more or less be, as already stated, in a perpendicular line. It will be noticed that injuries (v) and (vi) are entry and exit injuries *prima facie* indicating that the pellets which entered into the victim's left thigh penetrated through and through. The same is the position with regard to injuries (vii) and (viii) on her left leg. Two alternatives thus suggest themselves. Either that the same pellets which went through her left back (entry wound No. (i) and came out through the chest (exit wound No. (ii) hit the thigh and the coming out through and through also penetrated her left leg, both of which were in a line, or the three parts of her body were not in a straight line and different pellets dispersed from the shot penetrated the three limbs independently of each other.

In the case of the first alternative, there would be no question of a wide area of dispersal. In the case of second alternative, also, the dispersal would not be in any wide area. The site plan produced by the prosecution also makes it clear that there could not have been much distance between the victim and her assailant and, therefore, there was not much scope for any large dispersal of the shot. Such a conclusion is in harmony with the doctor's evidence, the places where the pellets entered into the victim's body and the evidence of the two eye-witnesses. It is true that in all at least eleven pellets entered into the victim's body at three places. The trial court observed that an S.G. cartridge would contain nine pellets. But as the High Court observed that was a personal observation made by the court without any such evidence. There was no evidence to show that the cartridge in question was an S.G. cartridge. No argument can thus be founded on an assumption that the cartridge was an S.G. cartridge. The police found five tiklis but they could be cardboard tiklis in which the pellets must have been packed. Their seizure by the police at the spot could not solve the question whether one shot was fired or more. Likewise, in the absence of evidence as to what kind of pistol was used by the assailant, passages cited by counsel from works on firearms can hardly be of any relevance. The fact of the matter was that the eye-witnesses were emphatic that it was the appellant who fired at the deceased with an improvised pistol, and that he fired once only. That evidence was backed by the opinion of Dr. Ghosh who equally emphatically opined that all the six gunshot injuries could be caused by a single shot. That evidence was acceptable to both the courts and nothing has been substantiated before us which can justifiably impugn that evidence. Counsel could raise only conjectural alternatives against the eye-witnesses' account as to how the incident occurred. Such conjectural alternatives cannot be substituted in place of accepted evidence of those who actually saw the incident.

8.21.46 Correct/Incorrect Inference[97]

1. During the course of investigation seven cartridges were recovered at the place of occurrence. One empty cartridge and one misfired 12 bore cartridge were found near the dead body of Tota Singh. Five empty cartridges were found lying on the southern Chabutari where Murti was washing clothes. A licensed DBBL gun was recovered at the instance of Gurdas Singh. An SBBL gun was recovered on being pointed out by appellant Bawa Singh. Four of the cartridges, according to the evidence of the ballistic expert, P.W. 13 Dr. M. Johari, had been fired from the single barrel gun recovered at the instance of Bawa Singh. Dr. Johari was definite that misfired cartridge was neither from the double-barrel gun of appellant Gurdas Singh nor from the single-barrel gun of appellant Bawa Singh. This clearly established the use of a third gun in the occurrence as was the prosecution case. Dr. Johari could not give any definite opinion about the other two empty cartridges as to whether they were fired from the DBBL gun of appellant Gurdas Singh. The findings of the ballistic expert and exemption of two persons from trial did create some confusion in the prosecution evidence and perhaps led the witnesses to make some changes or embellishments in their evidence.

97. *Gurdas Singh v State of Rajasthan*, AIR 1975 SC 1411 : (1975) 4 SCC 490 : 1975 Cr LJ 1218.

Nonetheless as found by the courts below, in material particulars the evidence of the eyewitnesses was trustworthy, credible and truthful.[1]

8.21.47 Sequence of Events[98]

1. It may be mentioned here that the site plan, relied upon by the High Court to give 7 feet as the distance between the door and the place on the sofa where Thakar Singh was sitting, was prepared by a draftsman, Bakshi Singh, P.W. 10, on 24 February 1970, at a time when the sofa was not there at all. He admitted that he had shown the sofa and its distance from the door only on enquiry from the investigation officer. We do not think that such a statement could be admitted in evidence. Moreover, even if we assume, for the sake of argument, that this distance was 7 feet and, also that there was a chick, as deposed by the witnesses, the shooting could easily take place from a distance of 6 feet by inserting the barrel of the gun by the side of the chick and taking aim while taking the cover of the wall adjacent to the door. Dr. G.S. Gambhir, the Medico-legal expert, who had performed the post-mortem examination, said, after looking at the injuries of Thakar Singh:

> *These injuries were caused when the nozzle of the gun was at a distance of about 6 feet from the body.*
>
> *These injuries could not be caused if the nozzle was 4 feet away from the body. By nozzle I mean 'muzzle' of the gun barrel.*

He also said:—

> *When the distance is less than 4 feet or 4 feet, the pellets enter the body* en masse. *If the distance is more than 4 feet, then the pellets will spread and will enter the body within a diameter of 2 inches from the main hole. In the present case there are three separate openings adjacent to injury No. 1 and there were four small openings around the second injury. I have not noted the exact distance of the various openings with regard to injuries Nos. 1 and 2. Upto a distance of 3 feet the pellets do not spread. My opinion is based on Modi's* Medical Jurisprudence.

The following injuries were found on the body of Thakar Singh:

> *One circular wound about 2" in diameter with lacerated margins on the front of the chest, slightly on the right side of the middle line. There were three small separate openings adjacent to the main wound. One circular wound about 1½" in diameter with a lacerated margin over the left shoulder joint. There were four small openings adjacent to main wound.*

These injuries show that Thakar Singh's back was probably turned towards the door when he was first hit. Perhaps that is why he was first struck on his left shoulder joint. He must have turned slightly after the first shot. Hence, the other injury is on the front of the chest on the right side. If the assailant had actually entered the room and shouted "Thakar Singh" and shot, the injuries would be right in front. In that case, there could have been no injury on the left shoulder joint. It may be mentioned here that the F.I.R. lodged by Joginder Singh does not mention that the assailant had shouted 'Thakar Singh' before shooting at him. He admitted this omission but gave no explanation for it.

Medical evidence also revealed that there was no blackening, tattooing, scorching, charring or singeing around the main wounds. It was, therefore, contended before us that the shooting must have taken place from a distance of more than 4 feet. The High Court had explained the absence of blackening and charring by observing that the cartridges inside the gun bore the word "smokeless" and opined that the shooting need not have been from a distance of more than 4 feet. It seems to us that the High Court had assumed that the cartridges found in the gun were actually of a kind which would not cause blackening or charring or singeing and that these were the very cartridges

98. *Datar Singh v State of Punjab*, AIR 1974 SC 1193 : 1974 Cr LJ 908.

used by the murderer. The requirements of a technically proper proof were wanting on this point. The ballistic expert, called in as a defence witness, was not even questioned on the point.

Here, we may refer to the evidence of ballistic expert Shri J.K. Sinha, D.W. 10, Assistant Director of the Forensic Science Laboratory, who was not produced by the prosecution probably because he had made a report showing that it was not possible to connect the cartridges with the gun as the impressions made by the hammer was too indistinct. The gun was proved, from its licence, to belong to Mohan Singh, the son-in-law of Thakar Singh. It was not sent for examination of any fingerprints on it. Had there been such evidence of the appellant's fingerprints on the gun, it would have furnished strong corroborative evidence. In the circumstances of the case, we find it difficult to link the gun with the actual weapon with which the murder was committed. It is not inconceivable that it was left deliberately outside by someone to confuse the investigating authorities.

8.21.48 Location of the Shooter[99]

The various matters mentioned in the judgment of the High Court on the question "whether the shots were fired from inside the drawing-room or from outside" are so convincing that one could not but come to the conclusion that the shots were fired from inside the drawing-room and not from outside. The various findings of bullet marks on the wall, the calendar, the door pane in the light of the evidence of the ballistic expert did not leave any scope for even a shadow of doubt that the doctor was hit by a gun fired from inside the drawing-room. The assailant at the time of firing was not and could not be visible to persons outside as the shots were fired from a place inside the drawing-room which was south-east of the western door. And that is the reason that Kalika did not say that he saw Shamim firing the shots at Gautam. He merely deposed to the fact of the former proceeding to the western room immediately after the firing. It may also be added that the fact that the shots were fired from inside the drawing-room was neither disputed in the High Court nor before us.

For the reasons stated by the High Court in its judgment, we unhesitatingly endorse its view that the shots were fired from the 20 bore DBBL gun which was recovered from the eastern room and the licence of which was in the name of Sikandar Jahan, stress was laid before us that P.W. 14, Sia Ram Gupta, the ballistic expert, had deposed with reference to the two empty cartridges found at the spot that the shots could have been fired from the 20 bore DBBL gun of Sikandar Jahan: the expert was not definite about it. We find no force in this.

8.21.49 Location of pellets and empty cases[100]

It is particularly submitted that the location of the pellets and the empty cases belies the story of the prosecution. The Court has not found any merit in this submission. It has come in evidence that the accused fired a few shots, including those which injured the person and caused the death of the deceased. The distance between the place where the incident occurred and the places at which the pellets/ cases were found is not so large as to create any doubt with regard to their placement. Pertinently, the witness-Senior Scientific Officer-cum-Ex-officio Chemical Examiner, FSL Rohini, Delhi, who examined the pistol and the bullets/ cartridges was not cross-examined on behalf of the accused, and it was not suggested to him that the empty case/ pellets could not have been found at the locations and they were actually found and shown in the scale site plan, in the natural course. It goes without saying that when a fire arm is used in a situation of the kind arising in the present case, the direction in which the pellets/empty cases/ cartridges may fall need not result in a predictable pattern.

99. *Shamim Rahmani v State of Uttar Pradesh*, AIR 1975 SC 1883 : (1975) 4 SCC 652 : 1975 Cr LJ 1654.
100. *Anil Kumar v State*, 2018 (4) ADR 168.

8.21.50 Contradiction and Conflicting Versions[101]

The High Court noted that a number of contradictions were pointed out in the account given by the eye-witnesses P.W. 3, P.W. 4, P.W. 5, P.W. 6, P.W. 7, and P.W. 31 and that the prosecution has not been able to explain the injuries which Nadar had on the palms of his hands which injuries, according to the High Court, indicated that he was protecting himself against gun fire. It is also observed that the contradictions were not minor as they related to the spot of the murder, the fields through which the accused passed and the manner in which the killing took place. There is also the question of incompatibility with the medical evidence regarding the distance from which the gun was shot and the way it was shot. It was of the view that the incised wounds were more likely to have been caused after death and the likelihood of a false story of knives of the assailant cannot be ruled out. As regards firing of a pistol, there is absolutely no corroboration and the evidence was characterised as a myth. The hole in the shirt could have been only caused by the firing of the pistol and nothing collected on the spot showed that Sohrab fired a pistol or he fired a pistol on Sobalsingh. The story of the pistol was, therefore, discarded. Notwithstanding these findings, the High Court found that there was unanimity in the evidence of all the witnesses that Sohrab fired the fatal shot or shots with a gun given by Nadar. This was corroborated by the medical evidence which indicates that the injuries on the deceased were due to gunshot injuries. There is also the evidence of the incident having taken place in a field in which the deceased was found and there was unanimity on the point that Nadar handed over the gun to Sohrab and Sohrab fired a shot on Sobalsingh who fell down after which a second shot was fired. The version of the accused that the gun shot injuries were caused accidentally will not be believed. The defence story that Nadar was easing himself when he was attacked all of a sudden after which a scuffle between Sohrab and Sobalsingh took place resulting in the accidental firing of the gun was difficult to be comprehend. The High Court however dealt with the several contentions urged in respect of the story that Nadar had handed a gun to Sohrab which he could have easily fired himself or that Nadar who is said to have caught Sobalsingh from behind should have been the first to have been injured, or that the directions of the injury on Sobalsingh indicates that the firing was from below when Sohrab was at a higher level, or that the witnesses could not have been seen from the place where they were or that Sohrab fired at Sobalsingh, or that he fired it when its barrel was at a distance of 11/2 cubits from Sobalsingh were all discussed, but they were not considered to throw any doubt on the main version of the eye-witnesses that it was Sohrab who had fired the gun while Nadar held the deceased. The conclusions of the High Court have been set out as under:

> *The argument that the shooter should have been at a level lower than the victim and such a state has not been told by witnesses. Rather the story clearly excludes such a possibility has, no doubt, some merit if we accept the story of the prosecution witnesses as told by them. We do not fully accept the same. In fact they saw the incident from a distance and the detailed descriptions are all inferences as even admitted by one of them. A man running for life and a mere following would be away quite far from the witnesses. The number of fields mentioned by the witnesses intervened the witnesses and the spot. In fact it has been a point taken up by the defence that on account of the distance they could not see. What we feel is they could see the broad facts, Sohrab's running on a mare, broad and easily visible actions that one could see from a distance. The rest of the details are imaginations and inferences. Nadar's injuries on his palms cannot be explained strictly on the basis of the prosecution version; but as we have seen the details are unbelievable, we can only say the witnesses could not see how the injuries on Nadar's palms were received. They were received undoubtedly on the spot and when gun was fired, Sobalsingh was no doubt held or appeared to have been held by Nadar from a distance. He must have tried to move, that moment was responsible for injury to his palms. The unassailable story, therefore, remains is that Sohrab fired a gun at Sobalsingh and Nadar handed over the gun to him. Both of them are, therefore, guilty.*

101. *Sohrab v State of Madhya Pradesh*, AIR 1972 SC 2020 : (1973) 1 SCR 472 : 1972 Cr LJ 1302.

8.21.51 Accidental shooting[102]

Harish Chander expressed a desire to see how the pistol is fired. The accused took out the pistol from his pocket and after removing the magazine from the pistol placed it on the bed. Harish Chandra asked him if the weapon was ready to be fired and the accused replied that there was a bullet inside. The accused took out the bullet and then demonstrated to Harish Chandra how the pistol is used. Harish Chandra also took the pistol in his hand and pressed the trigger by pointing it towards the roof. Harish Chander handed back the pistol to the accused who after loading it with the bullet and magazine, put it in the pocket of his pant. In the meantime, Nirmal Kanta entered the room and she also desired the accused to demonstrate how the pistol is fired. The accused again removed the magazine from the pistol but omitted to take out the bullet. He fired the pistol by aiming it at the deceased. The bullet hit the deceased in the forehead. On receipt of the bullet injury Nirmal Kanta fell to the ground. It is alleged that Lalita had also in the meantime come into the room. Lalita asked Harish Chander to call Asha Rani, mother of the deceased, who reached the spot within a few minutes. Nirmal was removed to the Irwin Hospital where she succumbed to the injury on 8 September 1970.

The post-mortem on the dead body of Nirmal Kanta was performed on 8th September by Dr. Vishnu Kumar (P.W. 1). He found an oval wound 0.5 cm. x 0.4 cm., width 0.2 cm. on the front of the middle of the forehead 1.8 cm. above the bridge of the nose. The doctor gave the opinion that the pistol had been fired from a distant range because there was no singeing, blackening or tattooing around the above injury. He also gave the opinion that the above injury was sufficient in the ordinary course of nature to cause death.

The accused in his statement at the trial admitted his marriage to Lalita Devi. He also admitted that he has a son named Rajinder Kumar from his first wife. The accused denied that on 5 September 1970 he had gone to invite Harish Chander and Nirmal Kanta for a game of cards but stated that they had decided to go for a picnic on the following day, that is, 6th September. He further admitted that on 6th September at about 10 am. Harish Chander and Nirmal had come to his house. The accused admitted that the pistol Ex. p 1, the magazine Ex. p 2, the cord Ex. p 3 and the fired bullet belonged to him. The accused stated that he had taken out the pistol from his almirah and placed it on the cot. The accused admitted that at the request of Harish Chander he had demonstrated to him as to how the pistol is used. The accused stated that before Nirmal Kanta had come into the room he had placed the magazine and the bullet inside the pistol and put it on the cot. The accused stated that Nirmal Kanta had requested Harish Chandra to show to her as to how the pistol is fired and that Nirmal Kanta had received the bullet injury while Harish Chander was demonstrating to the deceased as to how the pistol is fired. The accused admitted that Nirmal died as a result of the bullet injury.

Soon after the occurrence Sewa Ram had gone to the shop of Krishan Gopal (P.W. 9), and told him that one girl had shot herself in his house. Krishna Gopal informed the police of the occurrence as told to him by the accused. The accused did not stick to this version at the trial it appears advisedly, for the medical evidence showed that the pistol had been fired at from some distance. Before the committing magistrate the plea taken by the accused was that it was Harish Chander who had killed Nirmal Kanta accidentally.

On a careful perusal of the testimony of Harish Chander and P.Ws. 4 and 5 we are of the view that there is no clear and convincing evidence on the record with regard to the alleged motive.

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102. *Sewa Ram v State*, 1976 Cr LJ 242.

8.21.52 Murder, not Suicide[103]

In the background of the above contentions, it is unnecessary to go into a detailed discussion as to the manner of death or the nature of weapon used for the purpose. It can be safely presumed that the deceased met her end at the alleged time and place from a gun shot fired from M.O. I. with the cartridge M.O. II. Suffice it to say that the doctor who held the post-mortem found one circular wound 1½" in diameter situated in the right flank below the rib margin of the right side, 6" from the spine and 11" from the shoulder in the midaxillary line. The surrounding skin was blackened and scorched. A small lacerated portion of the liver tissue was protruding. The wound was 6" deep and its direction was horizontal to the foot. Besides these, there was an ecchymosis 2" x 1" x 1" behind the elbow joint of the right arm. On dissection, the material things that he found within the wound were six pieces of round cardboard and eight pellets from the liver tissue, which were sent to the investigating officer. These were examined by P.W. 3, the ballistic expert according to whom, the gun was fired from an approximate distance of 3 to 4 feet from the victim, and that angle of firing was approximately little over right angle to the surface of the body. The ecchymosis was explained to be due to fall after receipt of gunshot.

P.W. 3 is the ballistic expert and his report, Ex. 6, shows that the gun, M.O. I was in good working order and that the residue from the right barrel indicated that M.O. II (the empty cartridge) had been fired from that barrel of the gun. To certain suggestions indicating a case of suicide he has in his cross-examination negatived the theory when he stated that in view of the site of the injury and the angle of fire it is not possible that the injured could have shot herself to death. He further stated in cross-examination thus:

"A person with longer arms than myself may be able to shoot the gun, M.O. I, at himself.

If the gun, M.O. I, is firmly placed in position and then the trigger pressed by manipulation with a stick-like-article, it might be possible to shoot oneself".

But such a contingency can be safely ruled out in view of the positive evidence in the case that the gun had been placed in a Khatuli (small charpoy) *i.e.*, in its original position along with the rifle and the barrel was not towards the direction of the deceased. Further the cartridge, M.O. II, after firing, had been taken out from the magazine and placed on the table nearby. Such a situation is only possible when the assailant, after firing the shot, had enough time first to extract the cartridge and then place the gun and the empty cartridge in their respective places along with such other articles of the house as was found by the investigating officer.

The statement of the investigating officer concerning materials is thus:

> *I found that the double barrel gun and a rifle had been placed on a Khatuli 3½ feet from the head of the deceased. M.O. I is that gun, and M.O. IV is that rifle. The muzzles of both the guns were pointing towards the east. I also found that two 12 bore empty cartridges had been placed on a table over the khatuli and one of those cartridge cases smelt of gunpowder indicating recent firing. M.O. II is that cartridge case smelt of gunpower. There were two other 12 bore live cartridges lying on the table. The overshot wad, M.O. III was laying to the side of the dead body in line with the gun shot wound on the dead body. I seized the gun licence, Ext. 10 on production by the accused and some other live cartridges which were inside a locked box,* vide *seizure list Ext. 11.*
>
> * * * * *
>
> *At my bidding the accused had himself opened the lock of the box.*

103. *State of Orissa v Lal Chhatrapati Sai*, 42 Cut LT 419 : 1976 Cut LR (Cri) 100 : 1976 Cr LJ 1342 (HC).

8.21.53 Presentation[104]

It is further clear that the recovery was not made from the residential portion but from the place where cattle are tied, and the fodder is kept. The object was admittedly hidden from human gaze. The accused has farm-servants. It cannot be presumed that the place is not accessible to these farm-servants especially when it is a place for tying cattle. The exact location and its distance from the gate are not clear from the record. Under these circumstances, it cannot be held that the thing hidden at a place accessible to others in the house inhabited not only by A-I but also by another was in the conscious or voluntary possession of accused.

It was the duty of the prosecution to prove against the accused that M.O. II belonged to him, that he had secreted it or that he was in actual possession of the thing recovered. The mere physical presence of the accused in proximity to the object cannot by itself be an incriminating circumstance unless it can be held that he was in conscious and intelligent possession of that object. Merely because he is the head of the joint family or the owner of the house, he cannot be credited with constructive knowledge of a hidden thing. Possession must imply knowledge and there would be no possession when there is no knowledge.

It requires no elaborate argument to state that possession without knowledge lacks the element of *mens rea* or criminal intention which is essential for an offence. It cannot also be said that the weapon was under the control of the accused within the meaning of the Arms Act. "Control" under the Arms Act means that the accused must have power over the weapon so that he can direct its custody, production, use or disposal in some manner. Thus, in the instant case, it cannot be held that the said improvised smooth bore firearm which was lying buried in the manger at a place accessible to others was in the conscious or voluntary possession and control of the first accused. The offence under section 19(f) of Arms Act, is not, therefore, made out against him.

The prosecution has relied on the report of the Chemical Examiner and the expert evidence of P.W. 38. The report of the Chemical Examiner is to the effect that the barrel washings of the pistol (M.O. 2) were examined and the combustion products of the smokeless powder in them were detected, though the time of firing could not be stated. The Chemical Examiner has further stated that he examined the margins of the rents of item X and the scrappings from item XIII for products of combustion of gunpowder but he did not detect the products of combustion of gunpowder in either various items with the assistance of the firearm expert of the Crime Branch C.I.D., Madras are that:

(i) Item XII (M.O. 2) is an improvised pistol capable of firing a 12 bore cartridge and is in working order.

(ii) M.O. 7 was fired from M.O. 2.

(iii) M.Os. 8 to 10 could have formed part of 6 size 12 bore cartridge like M.O. 7 and could have been discharged from the same; and that

(iv) The pellets recovered are of No. 6 size and the pistol was discharged from a distance of 6 feet which can be concluded, having regard to the injuries described in the post-mortem certificate.

P.W. 38 in his deposition states that he fired a test cartridge with M.O. 2 and compared the pin-mark on M.O. 7 with the aid of a comparison microscope and he found agreement in shape and other finer striations and, therefore, he was of opinion that M.O. 7 was fired from M.O. 2. As regards M.Os. 8, 9 and 10 he states that they could have formed part of M.O. 7 and could have been discharged from it. He further states that the barrel washing of M.O. 2

104. *Kodur Thimma Reddi* (*Re)*, AIR 1957 AP 758 : (1957) 2 Andh WR 156 : 1957 Cr LJ 1091 (AP).

was taken and the combustion products of smokeless powder were found but the exact time of firing could not be stated. In cross-examination he says he did not take any photos of the pin-points, that a similar cartridge like M.O. 7 could be fired in a revolver of the same bore, even if hand-made, will have its own individual characteristics, in casting the pin-marks.

In scientific criminology the main principle of forensic ballistic is to establish whether a given bullet or cartridge was used in a particular weapon. The scientific knowledge during the past thirty years in this regard has advanced considerably. It is now possible not only to tally the cartridge fired with the gun used but a number of other important facts can be decided though with varying degrees of probability. Among these are the distance from which a shot was fired, the approximate time when the weapon was last fired and other questions of similar nature. These are all the questions that require a solution in the present case. As pointed out above, the cartridge was not found at the place of occurrence. But, it was at altogether a different place.

It is necessary that it should be first connected with the pellets that were ejected and then with the weapon that discharged the same. This is possible if not only the time of firing M.O. 2 tallies with the time of the incident but also the thumbprints of the gun on the cap and base of the cartridge tally with those found on the disputed cartridge and further the pellets are traced to the firearm in question. The conclusions of the firearms expert and the chemical examiner in this particular case do not take us far in the murder. So far as the pellets are concerned, the results arrived at by the firearms expert do not appear to be conclusive.

They only seem to bear the impress of a mere probability though with regard to the pin strike and finer striations on the base or the cap of the cartridge the opinion expressed seems to be definite and conclusive. But, unfortunately, he has not produced the test cartridge for comparison purposes. The learned advocate on that account has argued that unless the data be supplied or the enlarged photos be produced so that the opinion of the expert may be verified by the court, the court ought not to accept the opinion of the expert without satisfying itself of the correctness of the same. Reliance has been placed in *Balija Pullayya (Re)*, 42 Cr LJ 316 : AIR 1941 Mad 88 (I) ; *Harendranath Sen v Emperor*, 32 Cr LJ 1001 : AIR 1931 Cal 441 (J) and *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.

We feel that the test cartridge ought to have been sent to the court so that the court could be satisfied of the identity of the thumbprint of the gun on the breech face of both the cartridges.

As we have observed above, forensic ballistic concern with investigation of firearms and ammunition and of problems arising from their use for purposes of legal evidence. The firearms can be broadly divided into two main classes: (1) smooth bore arms; and (2) rifled arms. In the first comes the shotguns or the firearms like M.O. 2. M.O. 2 cannot be confused with an automatic or self-loading pistol which ejects the empty cartridge at the spot nor with a revolver which has a rotating magazine called cylinder.

Whatever its size, M.O. 2 is only a smooth bore improvised firearm. The rifles, revolvers, automatic and self-loading pistols and machine guns fall under the above-mentioned second class. The barrel of the second class being furnished with spiral grooves imparts spin to the bullet, thereby giving not only accuracy and penetrating powder but also the markings and the other characteristics of the barrel which carry individual peculiarities.

But, shots discharged from a smooth bore firearm scatter over an area that increases roughly according to the distance of the target from the gun, and besides these missiles do not bear the individual characteristics of the barrel so effectively as in the rifled arm. That is the reason why the pellets from a shot-gun, though can be measured, weighed and subjected to chemical analysis, cannot establish the identity of the gun that fired them though in the case of bullets

from a rifled arm the identification of bullets is possible with the help of a microscope and expert's services.

Lemoyne Synder in his book on *Homicide Investigation* at p 100 discussing the bullets from a rifled arm states as follows:—

When a lead bullet is fired through this barrel, these characteristics of the gun barrel will be transferred to the sides of the bullet so that bullets fired from a certain barrel will have characteristics which are peculiar to that particular firearm and to no other. In like manner other machine parts of the mechanism, such as the firing pin, extractor pins, the breech facing will likewise impart marks to the primer or shell which are characteristics of that particular weapon and to no other.

Thus, it is possible, when a bullet is found, in a dead body or any empty shell near where a gun is fired, to tell whether that bullet or shell was fired in any particular weapon which may be suspected of having fired the fatal shot.

C.J. Poison in *The Essentials of Forensic Medicine* at p 166 with regard to shotgun missiles states that:—

> *The pellets from a shotgun can be measured, weighed and subjected to chemical analysis, although the results have a relatively limited value.*

Thus, in this particular case where the pellets have been discharged from a smooth bore barrel firearm the expert's opinion cannot take us far. The pellets unlike the bullets do not bear the impress or the characteristic marks of the barrel of a particular weapon which distinguish them from those of the barrel of any other like a weapon.

The size of the pellets alone is not a dependable test not when their actual number is not correctly ascertained can they be in any manner connected with M.O. 7 to any degree of probability or certainty. It must be remembered that even in cases of bullet evidence the expert evidence should come before the court by means of photomicrographs. Nigel Morland in *An Outline of Scientific Criminology* at p 96 under the caption "Court and Bullet Evidence" states:—

> *Expert evidence of the highly technical kind with forensic ballistic deals, is usually presented to the court by means of photomicrographs that show the various significant points of agreement. The preparation of these demands a high degree of skill if all the relevant points are to be brought out and the possibility of error executed. It is a tribute to the way in which such work has been handled that, new though forensic ballistics is as compared with other sciences, courts today readily accept its evidence.*

Thus, it is evident that the evidence with regard to the identity of pellets not only labours under inherent want of precision but also is most unsatisfactory. The case of the prosecution that the missiles at the scene of occurrence were discharged from M.O. 2 must, therefore, fail. No doubt, the thumbprint of the gun on the cartridge plays an important part in establishing the identity of the gun provided the suspected cartridge can be connected with the incident, but in this regard too there is no material on record that the trial shots conducted have given the thumbprint of the gun in perfect unison with that on the suspected cartridge, M.O. 7. Lemoyne Synder on *Homicide Investigation* at p 100 while describing figures 32 explains the fired shell in the following manner:

When a cartridge is fired the explosion not only forces the bullet out of the barrel, but with an equal force it drives the shell back against the breech of the gun. The primer, being made of soft metal, will pick up any scratches or tool marks on the breech facing and these markings on the primer will be characteristic of that particular firearm and none other.

Nigel Morland in his book on *An Outline of Scientific Criminology* at p 91 characterises these markings as the thumbprint of the gun and describes them as below:

When a firearm of any kind is discharged, the gases generated by the combustion of the charge have two effects, they eject the bullet from the muzzle with considerable velocity, and they drive back the cartridge against the breech face of the weapon. The pressure with which the latter occurs is sufficient to cause the cap and base of the cartridge, which are of comparatively soft metal, to take an imprint of the breech face, in much the same way as a piece of wax pressed on to a seal takes an impression of the design. It is this imprint which enables cartridges to be identified as to having been fired from a particular gun.

While describing the method of examining cartridges, at p 92 he states as follows:

Broadly, therefore, the method of determining whether a cartridge has been fired from a given gun—often an important factor in crime investigation—is as follows: Several trial shots are fired from the gun it is desired to test. The markings made on the cartridges are compared with those on the suspected cartridge.

By a process of comparison and minute examination according to a fixed plan, identity can be established or disproved with a probability of error so remote as to be entirely outside practical consideration. To put the problem simply, it may be stated thus: the trial shots give the thumbprint of the gun. Has the suspected cartridge the same thumbprint? If it has, identity is established; if not, it is certain that the gun and the cartridge do not 'marry'.

In practice, as would be expected, the matter is not so simple as this and many difficulties and complications arise. To start with not only the marks already mentioned on the base of the cartridge and on the cap, but those on the body, or tubular part, have to be considered. There are others that provide clues, such as the indentation made by the firing pin and by the mechanism for ejecting the spent cartridge. The pressure of the cases formed by the explosion also plays a part in determining the nature of the thumbprint, since, owing to slight differences in the charge as between cartridge and cartridge, certain marks may appear on one cartridge, and not on another. This makes it clear that even the examination of cartridges requires minute care and thorough satisfaction for correct conclusions. The court drawing an inference from the opinion of the expert, therefore, should be satisfied of all these.

This is possible only when the requisite material is brought before it. Evidently but for M.O. 7 which is said to be a suspected cartridge, no test cartridges has been produced before the court so that the identity of the marks on the suspect may be established with the test cartridge. Indubitably, the evidence on record is scanty and does not connect M.O. 2 either with M.O. 7 or with the pellets that were discharged at the place of occurrence. As we have pointed out above the expert has expressed his inability to determine even approximately the time at which the gun must have been last fired. The chemical examiner's conclusion with regard to the range of firing too based wholly on the injuries described in the post-mortem certificate is not much dependable.

The diameter of the area in which the pellets lay is not ascertained for any estimate is based on tests with the suspected weapon. The overshot card or wad may also be a determining factor. But evidently that has not been made the basis for his conclusion. We think it unnecessary to enter into a detailed discussion on this behalf. It is, however, clear that the evidence of the expert or the chemical examiner in this case is of no help in establishing the identity of the pellets with the gun, M.O. 2. Neither M.O. 2 nor M.O. 7 can, therefore, be said to be an incriminating object in relation to the murder of the deceased. Thus, it is neither proved that A-4 or A-1 had owned or possessed M.O. 2 and M.O. 7 nor is it established that these were used for the murder of the deceased.

8.21.54 Insufficient Data[105]

It seems that the learned judges of the High Court were not at all impressed by the evidence of the expert, which they characterised as unsatisfactory and they were not also confident that the gun (Ex. P-16) had been used in causing the injuries to Dalip Singh. This appears from the following observations made by them in their judgment:

> *The gun P-16 was identified by Jita Singh as the gun with which Mohinder Singh fired at him and Dalip Singh but he identified the 'gun' because of a brass plate of its butt end. We have seen the gun. Its brass plate could be of no use for the identification of the gun.*

Again commencing on the nature of injuries found on the body of Dalip Singh:

> *What kind of bullet it was which, though it had blackened the area where it entered the brain showing that it had been fired from not far away, did not shatter the brain, we do not know? What kind of projectile it was, which entered the body (which if the evidence is to be believed it was fired at from a few feet at Dalip Singh) and passed through the body without shattering the inside of the chest or causing extensive damage therein is also not known. Mr. Sethi (counsel for the accused) quoted Taylor's* Book on Medical Jurisprudence *and Hatcher's* Book on Ballistics *and argued that the firing must have been from a place between 800 and 1,200 yards away in order that the projectile may pass through and through the body and not shatter it. That, of course, presupposes that the barrel of the gun (using the word 'gun' in the generic sense) is grooved which caused a projectile to go forward with a rotatory motion of something under a quarter of a million revolutions a minute and travelling at the rate of about 2,000 miles an hour when it leaves the gun. We do not know whether the barrel of this gun (Ex. P-16) is grooved or not. It is a single barrelled gun and is country made. The likelihood is that the barrel is not grooved.*

On a careful reading of the judgment under appeal, it appears that the learned judges of the High Court strongly felt that they had no adequate explanation in the oral evidence before them for certain puzzling features of the injuries on Dalip Singh. This is exactly what we also feel in this case, and it seems to us that the evidence which had been adduced falls short of proof in regard to a very material part when an injury is caused by a lethal weapon, it has always been considered to be the duty of the prosecution to prove by expert evidence that it was likely or at least possible for the injuries to have been caused with the alleged weapon. It is elementary that where the prosecution has a definite or positive case, it must prove the whole of that case. In the present case it is doubtful whether the injuries which are attributed to the appellant were caused by a gun or by a rifle. Indeed, it seems more likely that they were caused by a rifle than by a gun, and yet the case for the prosecution is that the appellant was armed with a gun and, in his examination, it was definitely put to him that he was armed with the gun (P-16). It is only by the evidence of the duly qualified expert that it could have been ascertained whether the injuries attributed to the appellant were caused by a gun or by a rifle and such evidence alone could settle the controversy as to whether they could possibly have been caused by a firearm being used at such a close range as is suggested in the evidence.

It is clear, and it is also the prosecution case, that only two shots were fired at Dalip Singh, and one of the crucial points which the prosecution, had to prove was that these shots were fired in such manner and from such distance as is alleged by the eye-witnesses. There is, in our opinion, a gap in the prosecution evidence on a most fundamental point and the error which has been committed by the courts below is to ignore the gap and decide the case merely upon the oral evidence of three witnesses, two of whom are mere chance witnesses and not altogether independent persons and the evidence of the third witness is open to criticism on the ground of his partisanship as well as the improbability of his having been able to see the firing at his brother after he had himself been shot at the back of the head. The learned judges of the High Court, after commencing upon the entire evidence, say in their judgments:

105. *Mohinder Singh v State of Punjab*, AIR 1953 SC 415 : 1953 Cr LJ 1761 (SC).

We are thus left with the evidence of three witnesses of the prosecution together with the state of wounds as shown by the medical evidence and an unsatisfactory statement of the expert.

They reject the evidence of the expert, and they consider the nature of the wounds to have created a serious difficulty in the case. Having arrived at this conclusion, it was a serious thing to rest the appellant's conviction wholly upon the oral testimony in the case which has remained unchecked and unconfirmed by expert evidence.

The real position appears to be that the prosecution case cannot be said to be wholly proved but only partly proved if it is permissible to use such an expression. This court, as was pointed out in *Pritam Singh v The State*, will not entertain a criminal appeal except in special and exceptional cases where it is manifest that by a disregard of the forms of legal process or by a violation of the principles of natural justice or otherwise substantial and grave injustice has been done. It seems to us that the present case comes within the rule laid down because the appellant has been convicted notwithstanding the fact that the evidence is wanting on a most material part of the prosecution case.

8.21.55 Probable and Categorical Evidence[106]

According to the prosecution case Swaran Kaur, the aunt of the appellant, was standing behind Dial Singh when the appellant shot at him and the shot which entered the body of Dial Singh came out and hit Swaran Kaur. The prosecution evidence itself is that Swaran Kaur was trying to dissuade the appellant and his people from quarrelling. Therefore, she must have been in front of him and could not have been behind Dial Singh. Moreover, even according to the prosecution evidence she was at least 25 or 30 feet behind Dial Singh when the shot was fired by the appellant. A third circumstance is that whereas the injuries on the deceased were in the chest the injuries on Swaran Kaur were a little above the knee. These three circumstances improbablise the prosecution story of the shot fired at Dial Singh going through his body and then going further and hitting Swaran Kaur, femur being fractured. The rib of the deceased was also fractured. In this state of the evidence the learned judges of the High Court thought it necessary to examine a ballistic expert. They have relied heavily on his evidence in order to sustain the conviction of the appellant. We have carefully gone through his evidence and are of the opinion that it does not help to establish the prosecution case, at least not beyond reasonable doubt.

According to the expert the parcel, Ex. P-1, contained two shots and the parcel P-2 contained one shot. The shots in parcel P-1 weighed 4.41 gms. and 4.24 gms. The correct weight of L.G. and S.G. shots is 4.54 gms and 3.54 gms. respectively. Therefore, the two shots in parcel Ex. P-1 were discharged from a cartridge of L.G. size. This part of the evidence may be accepted as correct even though there is some difference between 4.54 gms., 4.41 gms. and 4.25 gms. The shot contained in parcel EX. P-2 was found to weigh 2.76 gms. It could, therefore, be either an L.G or S.G. shot. The expert, however, says that the general shape of the undamaged portion indicated that the shot was possibly an L.G. shot. He was not categorical about it. He was sure that it was a factory made one. There are 6 and 9 shots in L.G. and an S.G. cartridge of standard size respectively.

Now in this case there were five injuries on the deceased all caused by shots. There were three injuries on Swaran Kaur. Even assuming that all these three injuries were caused by three injuries of the shots which entered Dial Singh's body, a position which we find it difficult to accept as natural in view of the force with which they have entered Swaran Kaur's body, there were two more shots, one found in the wall of Sardul Singh's house and another found in front of Malagar Singh's house. There are thus seven shots the presence of which has to be explained. The learned Judges of the High Court thought that the shot found in front of Malagar Singh's

106. *Mohan Singh v State of Punjab*, AIR 1975 SC 2161 : (1975) 4 SCC 254 : 1975 Cr LJ 1865 (SC).

house could have dropped from the person of Dial Singh when he was moving in the house of Malagar Singh or dropped from his apparel in which it had got caught after piercing through a wound. This is a proposition which appears to us to be far-fetched. There is no evidence to support such a proposition. The expert was not asked about it, nor was the doctor who conducted the post-mortem. It appears to us that the shots which could pierce through a body and hit another person at a distance of 30 feet and cause grievous injuries to that person cannot drop from the body of the first person or get caught in his apparel after piercing through his wounds. It also appeals to us that the shots which passed through the body of Dial Singh could not have travelled another 30 feet and hit Swaran Kaur with such force as to fracture her femur. Furthermore, the location of the injuries on the body of Swaran Kaur compared to the location of the injuries on the body of the deceased person cannot be explained as easily as was thought possible by the learned judges of the High Court. The expert stated that the shots after entering the body of Dial Singh, had deflected downwards and this was particularly true in the case of injury number one; secondly, that Dial Singh must have instinctively ducked while receiving the shots at the instants when the shots came out of his body. It is not possible to accept that all the three shots which entered Swaran Kaur could have deflected downwards. If Dial Singh had also ducked then the shot which was deflected could have gone still lower and could not have hit her at all. The evidence of Joginder Kaur that immediately after the gunfire the deceased was seen in a bending position and staggering with his hand placed on his wound cannot support this conclusion. A gunshot takes much less than a split-second to enter a body and we are unable to agree that Dial Singh could have ducked and that might have been responsible for the shots which entered his body finding a lower target when they came out of his body.

The expert stated that he came to the conclusion that the injuries on Dial Singh and Swaran Kaur were probably caused by one gunfire only. It must first of all be noted that he is not categorical about it.

The reasons for his conclusion are the dimensions of the injuries. He had not seen the injuries and it would need superhuman ability to come to a conclusion on this subject by merely looking at the description of the injuries or even the photographs given by the doctors. The dimensions of the injuries noted by the doctors cannot be correct to the extent of 1/100th of an inch. Most of the expert's answers are not categorical. He did not have an opportunity of seeing the injuries of the shots himself. He was mostly giving his answers on the basis of observations made by others and measurements noted by them. A small difference in the measurements one way or the other might make all the difference to the final result. We think it would be unsafe to place implicit reliance on the evidence of the expert for the reasons we have already given and hold that the shots which hit Swaran Kaur and which resulted in the death of Dial Singh were fired from the same gun in a single shot.

CHAPTER 9

FORENSIC ACCOUNTANCY & FINANCIAL FRAUDS

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9.1 GENERAL

Forensic accountancy, also called Forensic Accounting or Financial Forensics, is comparatively a recent avatar on the horizon of Forensics. It is a verification process of accounts of an organisation, department or of an individual to find out if there are any criminal lacunae, irregularities or illegalities (like fraud, embezzlement, forgery and deceit) in the accounts which need legal action against the perpetrator.

Forensic accountant is a Forensic Accountancy specialist. He is specially educated, trained[1] and experienced person in accountancy. He has acquired the expertise to appraise the given account data correctly to locate the depredations of the con artist if any. Ordinarily, he is a Chartered Accountant (CA) academically, a diploma or certificate holder in Forensic Accountancy and has acquired experience through in-service training. Further, he achieves proficiency in general or special fields of accountancy and skill in costing and valuation of materials including equipment, machinery and other paraphernalia used in business by the firm under investigation.

Auditing or Forensic auditing also involves verification of accounts. However, the purposes of the two streams are largely different. Forensic accountancy locates fraudulent lacunae, collects evidence thereof, and appraises the data generated to conclude whether a criminal

1. The Institute of Chartered Accountants of India, keeping in view the importance and need of the forensic accountant, has started a certificate Course in Forensic Accounting and Fraud Detection. E-mail Address: **amitgupta@icai.in and < fafp@icai.in>**

act has been committed or not. He prepares a report on the findings of the investigations. He gives evidence in criminal (or departmental) proceedings to present convincing proof of his findings.

Forensic Auditor (auditing), on the other hand, verifies whether the accounts have been maintained as per departmental instructions and legal requirements or not. He presents his audit report to department/requisitioning authorities. He does not investigate accounting crime. However, if he detects something fishy, abnormal or illegal in the accounts during his audit, he reports the same to the concerned authorities. This report can be used as evidence as per its definition[2]. They appoint a Forensic Accountant to investigate the possible crime. In short, the Forensic Auditor examines accounts to appraise whether the procedures/rules/regulations/instructions and law have been followed/obeyed or not.

Forensic Accountancy and Forensic Audit are, as seen above, distinct disciplines. However, most of the non-professionals take them as synonymous due to facts that both are involved in accounts. In many cases, when a fraud is revealed in auditing, the auditor has also to join in court proceedings.

9.2 NATURE

Forensic Accountancy also known is the art and science of investigation of Forensic financial crimes/frauds through careful evaluation of involved accounts, documents, account books, invoices, orders and receipt. In some cases, valuations of materials (stocks, pledged/hypothecated goods, building, machinery, construction and other work) also form part of Forensic Accountancy.

9.2.1 Purpose

The Forensic Accountancy frauds are committed in varied work situations. However, all of them have same/similar aims, to make money safely. Forensic accountant has the task to tackle his depredations. In practical terms, he has to:

1. Establish *corpus delicti*.
2. Establish the *modus operandi*.
3. Identify the fraudster/forger/con artist.
4. Identify his "business' partners" associate fraudsters.
5. Find evidence/proof to link the criminal/de-link the innocent suspect, with the crime.
6. Find out the disposal mode of the loot of the fraudster or possible site(s)/the mode where the loot has been secreted.
7. Ascertain the losses and to help recover the looted assets.
8. Suggest preventive measure to stem recurrence of similar frauds.

Forensic Accountancy is multidisciplinary. It needs business experience/acumen, investigative skill, accounting/auditing knowledge and familiarity with departmental rules/regulations/

2. A **forensic audit** is an examination and evaluation of a firm's or individual's financial record for use as evidence in court. A **forensic audit** can be conducted in order to prosecute a party for fraud, embezzlement or other financial problems.

instructions. In addition, he has to know scientific criminal investigation. The practitioner has to have a smattering of relevant law so that he remains within the boundaries of the law.

The forensic accountant may need help from other professionals in his investigative work to expose the secreted, mutilated or destroyed evidence. He has to have liaison with such professionals.

Alarm Bells for Accountancy Frauds

1. No departmental rules to fix accountability
2. No working manual or written rules/regulations for staff
3. Incomplete/ill-kept account books
4. Unbalanced accounts
5. No regular/proper/periodic audit/inventory
6. No proper filing system
7. Excessive fund transfers
8. Substantial fund tranfer to kith and kin
9. Improperly kept record of purchase/warehousing/goods movement/sales/transfers
10. Unsecured loans
11. Increasing losses
12. Poor bookkeeping
13. Unusual/inconsistent/abnormal transactions
14. Deficient policies and procedures for staff hiring
15. Employees' lifestyles inconsistent with salaries
16. Presence of chair-stickers taking no vacations
17. Unexplained resignations of upper management
18. Excessive debt/equity ratio
19. Special Purpose Entities (SPEs) to hide debt/loan etc.
20. Not employing qualified/Certified Public Accountant (CPAs)
21. Missig documents/record
22. Unrecorded transactions
23. Negative cash flow
24. Continued losses
25. Sudden unexplained resignation by staff member(s)
26. Reputation for corruption, shady deals
27. Offshore bank accounts
28. Customers/vendors Complaints
29. Incomplete invoices/supporting documents

30. Overriding of internal controls
31. Incomplete/mischaracterization of invoices
32. Unrecorded "off the books" payments
33. Payment to different suppliers with the same address

Forensic Accountancy frauds occur in all types of organisations, big or small. Their *modus operandi,* in general, is similar. Their investigative tools and techniques are similar. However, financial depredations are varied/vast/multi-directional/expanding. They include all sorts of frauds, embezzlements, misappropriations, false bankruptcies, all sorts of forgeries, false claims, impersonations, identity theft, hacking and the like. The losses due to these frauds are skyrocketing. Nevertheless, there are fraud alarms bells (box below), to which the management, administrators, corporations must pay heed.

9.2.2 Accountancy Crimes

Forensic Accountancy deals with crimes of varied nature, including the following:

1. Accounting/auditing, frauds: Wrong/manipulated entries.
2. Wrong loss estimates.
3. Procedures/rules/laws/instructions not followed to commit/promote fraud.
4. Phantom sales/purchase/write-offs/transfer/gifting carried out with ulterior motives.
5. Inflation/deflation of bills or goods (sale/purchase/stock), transport and labour are done to cheat the owners.
6. Valuations of transactions/stocked goods are manipulated to cause losses to one of the parties.
7. False inventories, to hoodwink the concerned
8. Cost accounting: submission of raised expenses and deflated returns.
9. Kith and kin syndrome: funds/assets/goods are transferred to relatives.
10. Benami transactions: investments in the name of bogus non-existing firms/ individuals/trusts to hoodwink the authorities, the concerned persons and the public at large.
11. Computers/Internet Digital Accountancy Frauds.[3]
12. Arson/Accident frauds, perpetrated to destroy financial/stock records.

The list goes on.

9.2.3 Forensic Accountancy Classification

Forensic Accountancy work is classified in the following categories for the convenience of study/discussion:

- Forensic Investigative accountancy,
- Forensic Legal (Litigation) Accountancy, and
- Digital Forensic Accountancy
- Forensic Accountancy in courts

3. Discussed in a separate section ()

9.3 INVESTIGATIVE ACCOUNTANCY

Forensic Investigative Accountancy work requires investigative skills, knowledge of accountancy/auditing, familiarity with the business processes, rules and regulations and abilities to present the findings effectively before the concerned authorities. Forensic accountancy investigator performs two main functions:

1. Establish *corpus delicti* after careful evaluation of the account data, that a financial crime has occurred and *prima facie* there is sufficient evidence for further detailed investigations.
2. Indicate/identify the perpetrator/his partners/helpers/victims/witnesses.
3. Assess the need for services of specialists for the investigations. This is essential as forensic accountancy cases are often complex financial dealings. They need multiple disciplinary skills, experience and modern tools and techniques (like computers) including the assistance of qualified/experienced specialists/experts, like:
   - Document experts
   - Forensic experts
   - Engineers
   - Computer/computer crime expert
   - Software engineers
   - The scientists/technicians of the firms, which installed/started/maintain the operation of the equipment being used
4. Determine the money/assets involved in the fraudulent transaction and the losses thereof,
5. Help to locate the whereabouts of the papers/assets/money defrauded.
6. Help to protect the recovered assets/documents/data/evidential data to get the whole picture of the incidence and provide convincing evidence in the courts.
7. Ascertain the nature of the crime, its *modus operandi,* its ramifications (telgi stamp scam!)
8. Determine its overall impact on the individuals(s), organisations or on the society at large.
9. Collect foolproof evidence about the crime for presentation in the court proof in, identification of and estimating.

Every forensic accountancy case is unique. However, in most of the cases basic investigative steps are the same. The investigative drill of a forensic accountant is:

1. He contacts the client(s) to get facts. They include all elements of the case; possible suspect(s,) estimated losses, how detected, the name of the informer, possible witnesses, *modus operandi* and the time frame of the occurrence/detection, the present location/status of the involved players/documents/evidentiary clues.
2. He collects the recent audit reports, including those before or after the occurrence of the fraud.
3. He, in the absence of a forensic audit report, he carries out a preliminary investigation to establish/eliminate the existence of *corpus delicti.*
4. He contacts the suspect and gets his version of the case. Sometimes the management had already procured the statement of the suspect(s). The forensic accountant collects copies of the same. However, in addition, he interviews/interrogates the suspect to extract the unstated information.

The above preliminary explorations enable a forensic accountant to get a fair idea of the various elements of Financial Forensics fraud in hand. Based on this knowledge, he evolves a working plan for a detailed investigation. The aims of the plan are to:

1. Assess the ramifications of the fraud and to determine the transactions/entities/inventories involved.
2. Identify the workload. Divide it into segments (parts). He locates/collects/copies/studies/examines/analyses all the documents involved or suspected to be involved in the given case, officially. He observes all the needed legal formalities.
3. Fix a tentative time frame for the various workload segments.
4. Identify the culprits covertly (or overtly).Record the number and identity of the participating fraudsters, the number and identity of insiders who helped the fraudster.
5. Identify the witnesses for interview/interrogation,
6. Identify (provisionally) the evidential documents/accounts books, likely to shed light on the fraud.
7. Identify the material stocks (goods) to be appraised/assessed/analysed/evaluated.
8. Identify specialist(s) who will are needed to assist the investigation.
9. Identify the fault line responsible for the fraud.
10. Identify measures to prevent recurrence of similar/other fraud by the same or other fraudsters.

After planning, the forensic accountant starts investigations. The nature of the work varies from case to case but the general outline is similar:

1. He extracts the relevant evidence and uses the same for his report, proof and illustrations.
2. He estimates the losses to the organisation, government and/or individuals involved.
3. He traces the money flight route and its final repository, where the loot has been secreted.
4. He suggests recovery mode of the residual assets.
5. He documents all the features of the fraud he has unearthed.
6. He collects evidence to prove the incriminating findings.
7. He finds proof to link the fraudster with the accountancy fraud, beyond reasonable doubt. Document experts, Forensic experts, Engineers, photographers, material analyst often provide invaluable help,
8. He carries out the valuation of the defrauded assets,
9. He prepares a rough report, after sifting the chaff from the grain, utilizing computerized application such as a spread sheet, database, and imaging.
10. After completing the investigations, he discusses/dissects the strengths and weaknesses of the rough report with his colleagues and hones a viable, intelligible comprehensive convincing report with proper data, proofs, photographs, illustrations and other graphics.
11. He presents a comprehensive report that is precise, concise and intelligible to the addressed audience. The report speaks for itself. It is free of ambiguities, double interpretations and without jargons.

The final report usually is a complete/comprehensive document in itself. It contains the name/details of the referral authorities, the nature of the problem(s) posed, the time frame, data, the documents and other evidentiary clues examined, the details of the findings with illustrations, the persons interrogated, the reports of the specialists involved, cogent reasons for the opinions expressed and the conclusions drawn from the evidence. He attaches copies of all the documents, reports and charts as appendices.

9.4 LITIGATION (LEGAL) FORENSIC ACCOUNTANCY

Investigative accountancy investigations are indispensable in exposing financial frauds. However, such exposures are useful/relevant only if they are acceptable to the courts and they utilise them for the adjudication of the case in hand. The forensic accountant has, therefore, to be a specialist in presenting the highly intricate (in most cases) evidence to the non-professional: the counsels and the judges in the courts. The qualified specialist does his homework with dedication and collects/prepares/presents the necessary data/photographs/charts/graphics, and explains them to the court. The presentation usually provides convincing proof.

Forensic Accountancy is helpful to the court in many ways, including the following:

1. It clarifies intricate/complex questioned financial issues to the judges/counsels/involved parties.
2. It appraises the forensic accountancy evidence of the expert of the opposing party; to find its strengths and weaknesses.
3. It assists the counsel in the cross-examination of the opposing expert, usually by providing a questionnaire[4].
4. It provides briefs, on issues involved in the case, to the counsel for arguments.
5. It finds rebuttal evidence to the presented evidence.

Investigative and legal forensic accountancies do not work in isolation. In fact, they are partners to achieve a common goal and travel the path hand in hand. In some cases, however, the buck stops after the investigative findings only. The parties realise the futility of taking the case to the court and settle the case themselves, with or without the assistance of a forensic accountancy specialist.

Forensic Accountancy is not the be-all and the end-all in all financial frauds/disputes. The ideal situation is fraud-free environment and work culture. However, the utopia is far above our heads. The following mantra can promote it:

1. Recruit only an honest person. Modern science can help in this regard[5].
2. Make periodic check for honesty angle of the staff compulsory.
3. Observe strict control over the fraud trilogy (men, materials and situations) through eternal vigilance.
4. Treat employees as partners.
5. Adopt fair business practices.

Forensic Accountancy provides legal forensic support to counsels in many matters including injury claims, family disputes, contract disputes, insolvency litigation, insurance claims, royalty accounting, shareholders disputes and intellectual property claims.

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4. Some courts allow the second expert to cross-examine the presenting expert directly, after giving him the power of attorney.
5. Brain Printing, Psychological Detection of Deception, and Narco-analysis test.

9.5 DIGITAL FORENSIC ACCOUNTANCY

Digital Forensic Accountancy is a new avatar, which has come up in the wake of the use of electronics in all aspects of the business. The extensive and ever-expanding use of computers, the Internet and other electronic devices in the business transaction has created a fertile field for the con artist. He is reaping a rich harvest from his Digital Forensics frauds. As society is going towards a paperless society, electronic gadgets will do the accounting work increasingly. The computer, including laptops, tablets and smartphones coupled with the Internet are the new workhorses in accounting and auditing. The misuse of these gadgets and processes has given birth to Digital Forensic Accountancy. These very gadgets (and other specialised software) also help to investigate Digital Accountancy frauds.

9.5.1 Nature

The Digital Forensic Accountancy frauds are similar to hard document forensic accountancy frauds. However, instead of a paper trail, the Digital Forensic Accountant has to deal with plethora of digital data, usually protected through:

1. Passwords.
2. Encryptions.
3. Hiding it in innocuous files.
4. Deletions.
5. A prior command to destroy incriminating record at the specified action (e.g., opening the file) or specified time.
6. Encryption of digital data.
7. Transfer of data to other computers or electronic devices.

Digital Forensic Accountant faces a harder task. He has to deal with elusive data (deleted data, secreted data, manipulated data, stolen data, and transferred data to other computers). He, therefore, has to be vigilant, secretive and ready to seek other expert's help, whenever he needs it. He keeps the impending forensic investigations confidential so that the fraudster is caught unaware and he does not get an opportunity to fiddle with the computers and other digital data storage devices and the accountant seizes the device in an un-tampered form. The seized equipment is protected from remote control fiddling with Faraday security devices.

9.5.2 Hurdles

There are some hurdles peculiar to Digital Investigation. They need special attention of the Digital Forensic Accountant:

1. Integrity of the digital document

The Digital Forensic Accountancy work is not done on the original digital document as it can change/mutilate/destroy the original contents in the process. Thus, it loses its integrity. The Digital Forensic Accountant, therefore, always starts his investigations on an authentic copy of the document, usually, self-prepared. He safeguards the integrity of the original digital document zealously.

2. Volatile digital data

The volatile data gets lost if it is not saved. It is saved by taking its images.

3. Tampered data

The accountant/auditor of the organisation may have changed the relevant data for the benefit of the employer corporation. Digital Forensic Accountant must check and locate changes if any.

4. Time Element

The time lost between the detection of the fraud and initiation of the investigation should be minimal. The computers/laptops/tablets/mobile phones and other digital paraphernalia must be seized immediately and protected from interference through remote devices faraday bags/ vaults are used to protect the seized devices/data. Further copies of all the relevant data must be prepared at the earliest.

9.5.3 Investigation

Digital Forensic Accountancy fraud investigations generally involve all usual Forensic Accountancy aspects (accounting, auditing, departmental rules, governmental laws, valuations and investigative skills to collect/analyse/evaluate evidential matter and to present the evidence precisely, concisely, comprehensibly and convincingly). The Digital Accountant has to know them. Besides, he has to be well-informed and well-versed in computer science and other relevant technologies. Usually, he adopts the following modes of investigations:

1. He interviews the whistleblower, the colleagues of the fraudster, the immediate supervisor, the victim, the suspect and the possible witnesses.
2. He examines the involved digital trail to locate evidence. He ascertains the missing links.
3. He investigates the background and the present lifestyle of the suspect.
4. He Interviews all those who have knowledge about the transaction(s).
5. He consults, covertly, the vigilance people who might have a dossier on the suspect.
6. He gets the suspect digital data and other materials analysed from the relevant experts to collect Electronic Evidence.
7. He checks the physical and electronic surveillance, if employed, to record the activities/movement of the suspect.
8. He collects undercover operations' evidence.
9. He dives deep into the financial ocean to find missing links, lacunae and acts of fraudulent omissions/commissions.

9.5.4 The Tasks

Digital Forensic Accountant has to know account, accountancy and knowledge of electronic equipment used in accounts. He has also to know the *modus operandi* of the fraudster and he has to have skills and abilities to understand their manipulations, to perform his Digital Forensic Accountancy tasks effectively. His main tasks are:

1. The first and the most important task is to protect the evidence available in the seized equipment so that it remains whole and in original form. In other words, no part of the evidence is changed/mutilated/destroyed.
2. He has to be computer (and other gadgetry) and internet savvy. He must know web servers, firewalls, attack methodology, security procedures and penetration testing.

3. He has to consult a Forensic Psychologist to understand the working of the mind of the fraudster, the perpetrator of digital Accountancy frauds.
4. He uses reverse engineering to extract evidence from the hard disk, file systems, directories and files.
5. He uses software (available in the market) to extract the data from the above equipment.
6. He takes the help of the decryption expert when needed. In some cases, keywords/phrases help him. Some software programs save forensic accounting investigators thousands of man-hours by compiling data and identifying patterns. In addition, computer programs can track fraud as it happens.
7. Involves concerned Information Technologist, risk management, security, law enforcement agencies to seek their help whenever the same is needed.
8. He detects and investigates unauthorised activity in the equipment if any.
9. He constructs a digital trail of the suspected accountancy frauds to discover the evidence, which pins the crime to the perpetrator.
10. He inter-links (co-relates) the evidence secured from different sources.
11. He sifts/consolidates the evidence that can be used in court to provide clinching evidence to prove the fraud.
12. He estimates the incurred losses with facts and figures.
13. He understands:
    - The organizational set up of the company involved.
    - The procedures/rules/legal protocol for the case being investigated.

Digital Forensic Accountancy requires a multipronged approach. Relevant fraud investigation software is cost and time effective. They must be used. However, equipment is no substitute for efficient digital forensic accountant. He identifies the fraud patterns, follows the trails, and gets the details of the fraud from the whistleblower and a variety of information from other witnesses. All informants reduce the area of search and promote investigations.

9.5.5 Gadgets

The modes of misuse of computers and other electronic gadgets in Digital Forensic Accountancy are vastly varied and highly intricate. It may be extremely difficult, at least in some cases, for the Digital Forensic Accountant to explore and extract the relevant fraud evidence and prepare a court case single-handed, without the help of computer scientist and other experts/specialists/technicians of the manufacturer of the equipment/maintenance staff. The Digital Forensic Accountant should use their services.

The computer specialists use a variety of software to extract the relevant data, without affecting the integrity of the data, from the equipment, including the following:

1) Passware Kit

Passware Kit is software, which permits access to all password-protected, even encrypted data, in a computer without modifying files or settings. It recovers files and websites passwords.

Passware Kit Forensic is suitable for forensic purpose and maintains the authenticity of the evidence.

2) ACL Desktop

Audit Command Language (ACL) is a tool to read and analyse the type of files scattered across numerous database platforms in a computer. The file and data can be accessed almost immediately. Thus, entire data can be seen and potential areas of interest can be highlighted. The software makes it possible to locate errors and potential fraud; as claimed.

ACL software has **"read only"** access. Its use, therefore, does not affect the integrity of the data.

3) Helix

Helix is software, which helps to acquire proper images from the hard drives and partitions on systems. Many companies have come up with similar software.

Helix software provides information on the basic Systems (Operating system, network and a summary of the contents on the drives). It can furnish exact copies of hard drives, floppy disks, or memory, and store them on removable media, or over to a network.

Helix is also used to scan a system to see if there are any suspect graphic images on the system.

The courts of some countries accept the evidence extracted through Helix software.

4) UltraBlock

UltraBlock (a Brand name) is software used in Digital Forensic Accountancy. It is applied to the data disk being accessed. The software blocks any attempt to change/modify/delete the original data. Thus, it safeguards the integrity/authenticity of the data.

The software and its modifications are useful to access data from all types of data storage. The software is **"read only"** types. Thus, integrity/authenticity of original data remains unchanged.

5) Advance Hash Calculator

Data integrity is basic in Digital Forensic Accountancy. The courts do not admit evidence integrity of which is doubtful. Once a judge, while discussing integrity of evidence, remarked[6]:

Reit par tahmir-e-makan koi kaise kare

SHA-2 uses hash value of the data to preserve integrity of the data. The version of the Advance Hash Calculator, has been the favourite with the investigators for some time. It also includes imaging software.

Computers are an excellent device to hide frauds. However, techniques are known to locate, acquire and analyse the data stored in a suspect computer. The retrieved data provides high quality irrefutable evidence in courts. A Digital Forensic Accountant can, with the help of these devices/software extract, analyse, co-relate and manage the digital evidence. He can, thus, help to stem the ever increasing and expanding tide of Digital Accountancy frauds.

6. Means "***How can a man build a house on sand?***"

9.6 FORENSIC ACCOUNTANCY IN COURT

The forensic accountancy evidence after it is located, found and appraised, is presented in the form of a report to the court. A good report in addition to informational data has the following features:

1. It is written in simple common man's language without technical jargon/terms,
2. Theories/formulas which are beyond the comprehension of the involved non-forensic accountants professionals.
3. It is well reasoned and supported by data/illustrations/photographs/precedents/authorities.
4. It is precise, comprehensive, yet concise and convincing.
5. It discusses both supporting and non-supporting evidence to the main thesis of the report. It indicates the (overwhelming) preponderance of the supporting evidence,
6. It covers the divergent evidence also and shows its insignificance.
7. It contains a brief resume of the engaged Forensic Accountant/expert. It includes his academic qualifications, certification (with depth of the certificate course/the name of institution) as Forensic Accountant, his training (nature/extent), the depth of his experience in accountancy. The number/nature of cases examined is fair index of the depth of experience.
8. It contains a certificate that the tools/techniques used are standard. Forensic Accountant fraternity uses them routinely and the courts accept them.
9. A certificate that the data produced in the report conforms to the standards recognised/accepted for such reports and is adequate.

The tough nut is often the cross-examination by the opposing party with/without the assistance of another Forensic Accountant. Here the aim of the cross-examiner is to:

- Discredit the Forensic Accountant.
- Discredit his evidence.
- Elicit additional evidence, favourable to the defence.

For a counsel, usually, the task of cross-examination is tough (not impossible) as the accounts are a hotchpotch fare of genuine and false data. They are so entangled *inter se* that the extrication of truth needs expertise/experience/patience. Seasoned counsels usually prefer to engage defence Forensic Accountant for assisting them in the cross-examination and processing the Forensic Accountancy evidence for his client.

9.7 FORENSIC ACCOUNTANCY PROCESS

9.7.1 Basic principles

Forensic Accountants follow the following principles in processing Forensic Accountancy frauds. They:

1. Dive deep into the organisation's document records (written documents/computer files) to locate lacunae/missing links and other fraud evidence. Computer crime specialists help.
2. Suspect all members of the organisation. It has been found that the senior staff and those near retirement are more likely to commit accountancy frauds.

In a bank holdup, the local police believed that some bank official was involved in the holdup. They insisted upon a polygraph check of all the members of the staff including the bank president to find out the truth. The president was persuaded to be the first to be examined, to set example for the subordinates. The polygraph examination was to start next morning. At 4.30 am, the president "confessed" eloquently to the crime. He shot himself dead! (CH)

3. Find answers to the questions**:** where/when/what/how/why the fraud occurred. Who is the suspect(s)? Who are the victims? The answers to these questions indicate the manipulations/modus operandi of the Forensic Accountancy frauds.
4. Examine minutely the documents or digital data involved to locate alterations (additions, eliminations, erasures, obliterations) and check for forged seals stamps/signatures/format/handwriting. Requisition Expert helps if spurious documents are suspected.
5. Interrogate possible informants/witnesses.
6. Start Forensic investigation immediately after detection**.** In processing financial fraud investigations delay is fatal to the case. The evidence is destroyed/mutilated/stolen/hidden/misplaced. Witnesses forget the case and its details. If money is involved, it is spent/laundered/secreted or given to kith and kin.

9.7.2 Investigation Drill

Investigative drill of Forensic Accountancy frauds (like black money, money laundering, embezzlement, hidden assets,) is an orderly, step by step, investigation, inquiry, testing, analysis, inspection of assets, or examination of documents, trailing of the missing documents and location of looted money and assets to unravel the forensic accountancy crimes. The Forensic Accountant follows the drill:

1. He examines the legality of the transaction. He checks the laws of the land and rules, regulations and instructions of the department. If they have been flouted, the wilful deviation is brought to the notice of the concerned.
2. He ascertains whether the procedures have been followed or not. He records the ignore process/rules.
3. He checks the documents:
   - Are all the involved documents available?
   - Are some documents missing?
   - Are the documents genuine or forged?
   - Are the documents original/tampered/altered/replaced?
   - Are the receipts genuine? He checks each individual receipt.
   - Do the receipts account for the total sale? Overstatements/understatements of income are common fraudulent practices. The check reveals them to indicate fraud.
4. He compares the financial statements and the receipts/bills/vouchers/account books, to ascertain if the statements are based upon correct data.
5. He follows the trail of important transactions from start to end. It is to verify if the transactions are real and orderly.

6. He ascertains the ramifications:
   - existence of more similar fraud cases
   - Involvement of other branches
   - Possible involvement of other associate corporates
   - Repetitive? Likely to reoccur?

9.7.3 Action

1. Seizure of devices/electronic Media

Once the Forensic Accountant has detected an accountancy fraud, his immediate action is to seize the document and the electronic gadgets containing the incriminating data and keep it in safe custody beyond the reach of the culprit, his associates or well-wishers so that they cannot tamper with the records. In the case of electronic devices, say a computer, he ensures that the data in the device is not deleted, changed or hid by remote control. Faraday purses (for mobile phones) boxes and chambers are used to protect the devices from remote control interference.

The Forensic Accountant may not have the authority to seize the evidence. He approaches the authorities/police to do so.

2. Investigations

- The Forensic accountant collects the documentary, material, oral and digital evidence. He studies, examines, and evaluates the total evidence. He finds the missing links, the incompatible data, the wrong evaluations, the inflated/deflated bills and the manipulated invoices, the non-existing (fictitious) beneficiaries. He prepares a list of all the fraudulent events. He rearranges the list to make it a connected whole. Based on the findings he writes the Forensic Accountancy report.
- During the investigation, Forensic Accountant also finds some contradictory evidence to his main thesis. He evaluates the evidence and finds the reason for the existence of such evidence. He discusses the contradictory evidence in his report
- The Forensic Accountant is asked to investigate some specific aspects. He finds evidence or some and not others. He prepares the report in two parts; one of those he has been able to find evidence and the other for those where he could not collect evidence for a definite positive/negative report. He mentions the reasons for the failure.

3. Losses

The Forensic Accountant identifies and estimates losses. He indicates the avenues where the money has gone/secreted and how it can be recovered. He identifies:

- Suspected losses
- Recovered amounts
- Recovery from insurance company
- Losses to be written-off
- Net corporate losses

The supporting evidence, point wise, should form part of the report. The conclusions/recommendations should be clear – free from any ambiguity or of double interpretations.

9.7.4 Police cases

Police investigate the criminal cases. There are numerous police investigating agencies Including, local Police/CID/CBI. The RBI has also provided investigation guidelines to banks.

9.8 FORENSIC ACCOUNTANT

Forensic Accountant is an investigator of accountancy crimes and an appraiser of findings of opposing Forensic Accountants. He locates evidence. He prepares a comprehensive report. He is often required to present his findings in the court or departmental proceedings. He often faces cross-examination, from the opposing side.

Forensic Accountants are a class of specialists, trained to dive deep into the accounting record oceans. Curiosity; scepticism; persistence; creativity; and attention to details are their hallmarks. Further, knowledge of the business in hand and materials involved therein and sound professional judgment are indispensable. They are familiar with the legal requirements and procedures involved in Forensic Accountancy. Above all, they have the uncanny insight to discriminate substance over form (sifting grain from chaff).

Some Forensic Accountants go in for Alternative (out of court) Dispute Resolution (ADR) work. Thus, they handle mediations and arbitrations to resolve the business dispute and minimise expense, time loss and business disruptions.

Forensic Accountants analyse, interpret and present complex financial and business account records and statements in an intelligible, concise, precise, well-illustrated (with photographs, sketches, charts and graphics) reports which speak for themselves. They explain the findings, if necessary, to all, including the professionals of the criminal justice system.

Forensic Accountants take into consideration all alternatives, dive deep into the details, thrash out the evidence with colleagues and visualize the connected whole, to present a complete and correct picture.

Forensic Accountants have to be a perfect communicator (listen, learn, assimilate and convey). They deliver their findings/views effectively in a precise, concise and comprehensive manner orally while giving evidence in courts or writing, in the form of reports.

Forensic Accountants handle many issues relating to accounts disputes, including insurance/securities frauds, bribery cases, money laundering. They estimate and locate proceeds of crime, thefts. They appraise material disputes, professional negligence, assess economic losses due to cheating, embezzlements, breach of contract, diversion of resources, They handle valuations, trace missing assets, recover embezzled/stolen money/assets. They identify accounting lapses/lacunae.

Forensic Accountants and Forensic Accountancy have emerged, comparatively, recently. They have acquired tremendous importance is a short time. The practitioners are academically qualified, professionally certified and legally identified as competent Forensic Accountants, based on their academic qualifications/training/Certification/professional experience/performance. They also present/defend the evidence they have located/collected/presented in financial fraud cases, which they investigated.

The Forensic Accountants offers many advantages over the departmental auditors including:

1. They are independent investigators. Hence, the investigations carry greater credibility.

2. They are professional investigators, specially qualified and experienced to investigate the issue(s). Hence they give correct findings.
3. As organised professionals, they have the required staff, expertise and the essential equipment to handle the work efficiently.
4. They have the required experts (Document Experts, Forensic Experts, Engineers and others) at their beck and call to get the needed help.
5. Above all, they have the expertise in accountancy to handle the investigations professionally and efficiently.

A bird's eye view of the nature of the Forensic Accountant's work is in the text box above.

ANNEXURE 1

FINANCIAL FRAUDS

(Genesis & Prevention)

MEN
(Staff, service provider, Vendor, customer, fraudster)
MATERIALS:
(Documents, goods/machinery instruments gadget, goods etc.)
SITUATIONS/OPPORTUNITY
(Loopholes in Transactions, Rules and regulations, policies, inefficient control systems/Post-fraud handling)

Fig. 9.1

Genesis of Frauds

Financial frauds are the result of inter-play of the trilogy of frauds:

1. **Men (**s): negligent management; corrupt partners, crooked staff; dishonest service providers/vendors; careless/dishonest customer and professional fraudsters.
2. **Materials:** Documents, Electronic gadgets and modes), and a host of materials, mercantile goods, machinery, property, and miscellany of assets.
3. **Situations/Opportunities**. There are too many situations where the fraudster gets opportunities to commit financial frauds, including:

1. Blind trust.
2. Lack of checks and balances.
3. No oversight.
4. No accountability.
5. Duties not properly specified.
6. No rotation of duties.
7. No proper tranfer policy. Staffers allowed to take roots at one seat/one place.
8. Lax rules.
9. No proper audit.
10. No inventory.
11. Delayd and inefficient investigations.
12. No deterrence.
13. Corrupt mangment: joins hand with the fraudster.
14. Company engagd in shady transactions.

The situations where the fraudster can make hay is available in most of the work environments. Computers and cyberspace have added a vast new arena to the depredations of the fraudster. Financial Forensics has spread and spreading all around. The role of Forensic Accountancy has gone up many folds and is likely to expand further in the coming times.

I) Men

Men (and women) are the most important component of the trilogy. They are the actors in the drama of the perpetration/perpetuation of financial frauds. Human beings are selfish, and most of them are dishonest. However, social environment, education, deterrents, preventive action, and controls keep them at bay. An old USA estimate indicated that:

- 25% persons are always dishonest
- 50% persons are fence sitter, they commit fraud when they get **'safe'** opportunities
- 25% persons are generally honest under normal circumstances

Then who commit frauds? Not all! The fraudsters have some special characteristic features and pliable disposition that make them con artist. They possess conglomeration of a somewhat excessive dose of dishonesty; some compulsion(s); some defrauding ability, skill and above all they possess a will to commit frauds.

They are on the lookout for suitable opportunities to defraud. In earthly terms the persons involved in financial frauds are:

- Dishonest staffer
- Rogue customer
- Service providers
- The professional
- Vendors
- Money launderers
- Drug traffickers
- Terrorists

Fig. 9.2

Fraud's Quintessential Quintet

1. The Staff

All financial frauds are the result of the failure of the staff, supervisors and management included. For example, in banking frauds in India, the bankers are involved, directly or indirectly, in about 64% cases (a current report of RBI). Most of the times it is their wilful act, sometimes it is their miscalculation about the risk factor and infrequently it is the disregard for the rules and regulations, the system and the policies of the bank. Over-trust, incompetency, negligence, and ignorance of the banker help in other cases.

Financial Frauds are
Failures of the management

2. The portrait of a fraudster

The fraudster has a distinct personality. He is identified in most of the cases without difficulty. The main characteristics of his personality are:

a) He is efficient

He finishes his work well before time. Consequently, he has plenty of time to develop public relations with colleagues and customers.

b) He is obliging

He obliges everybody. He goes out of the way to help his superiors. He helps his colleagues who are bogged down with backlogs and find themselves hard put. He is helpful to his subordinates. He tolerates their inefficiencies, provides a helping hand and even takes over their work with a

smiling face. He obliges even customers. He provides them with information, helps them with the procedures and puts in a word to his colleagues for quick disposal of their cases.

c) He is a "know-all"

He knows everything: rules, procedures, persons, the services provided by the organisation and the conditions thereof, relative merits and demerits of various transactions. In addition, he knows their loopholes, difficulties and trouble spots of the working of the organisation. Thus, he is a guide to his superiors, to his colleagues, to his subordinates and to the customers. He is always busy dispensing information, putting in a word here, a word there and giving a helping hand to all who need.

d) He is "Indispensable"

The knowledge, the efficiency, the hard work, the obliging nature of the fraudster makes him indispensable. He does not go on leave. He sticks to the same post and branch indefinitely. His transfer from the place is unthinkable. If the head-office transfers him, the whole branch exerts all the influence to retain him in the branch as he has made himself indispensable to all. Thus, he continues in the same position for years together.

3. The rogue client/customer

The general fall in the moral values is almost universal. It is bringing in the rogue customer/ partner/client increasingly. He may be an individual, a group, a company, a corporation, an NGO, a Trust or the like. The usual *modus operandi* includes using fake or altered documents, impersonation, loans on fake documents, kite flying, spurious hypothecation goods, removal of pledged goods, non-payment of the instalments, credit card manipulations, Now it is the computer, the internet or other electronic entities that are deployed to steal the password, the electronic identity, the data, the software and the account numbers. The new technology (digital accountancy, telemarketing and cashless transactions) are adding to the woes of the common person.

4. Service Providers

Service providers are the persons who programme, maintain and service the equipment (computers, internet, software and other electronic gadgets) of various organisations. Their depredations, whenever they occur, are often very costly. They steal the passwords and tamper with security installations and misuse them to defraud the organisations.

> *Stanley Mark Refkin was a* ***computer programmer****, employed by many a bank. One morning he walked into the wire fund transfer room of Western Union Bank, in Los Angeles. He had earlier seen the working of the transfer of money to all parts of the world in that room. He had done his homework: where to transfer the money and what to do with the money. He came there, officially, to check the transfer system. He had been coming to do so earlier also. On the day of the fraud, he posed as a trouble-shooter and wanted to correct the fault in the transfer system. Nobody suspected his* bona fide*. He befriended a young operator and learnt the process and password of the transfer of money. He went out and from a public telephone, phoned the bank and with little effort he got 10.2 million dollars transferred to an account of a diamond dealer in Switzerland. He flew to the country and returned with the diamonds***! (CH)**

5. The Professional

He is the big game master. His depredations cause heavy losses. Forgery of hard or electronic documents is his common mode. He may manage to take big loans on fake documents; he may use stolen or fake credit cards on a massive scale, fake ATM Cards, EFT or NEFT technology

to transfer money from bank coffers to his account. He may be a Ponzi schemes master. He often steals and usurps the identity of the victim and defrauds him.

> *Mr.Charlie Koissi*[7] *was an honest person. He was working as Research Assistant in Pasture Institute in Paris. He lost his French national Identity card in 2005. He had forgotten about the incident. However, one day, while going abroad, in 2007, he was arrested at the airport for financial frauds in Germany. He protested that he had never been to Germany; but to no avail. He was sent to jail. He was released only after his Institute gave the certificate that he was on duty at the material time/period.*
>
> *After two months, he was again arrested. He had to produce the duty certificate again for release.*
>
> *It was clear to him that somebody was misusing his identity. He sought help from his friends and engaged a detective. A lot of evidence was unearthed but the police did not take any action. However, they believe (March, 2014) that they are closing on the identity thief.* (CH)

6. Vendors

They are the persons who transact business with the organisation, trusts and individuals. A dishonest vendor may introduce a 'Trojan Horse' and get secret information like passwords, command software and other secret data and misuse them to the detriment of the victim. Vendors include:

- money launderer
- drug traffickers
- terrorists

II) Materials

Frauds are perpetrated through materials. The important fraud vehicles used in classical frauds include:

1. Documents

Business transactions and documents are inseparable, though the nature of documents is undergoing a sea change. The paper document is giving way to an electronic document, to paperless society. However, the paper document still rules the roost; volume-wise. The manipulation of bank documents offers the easiest, the least dangerous and the quickest means to riches. It has attracted many an evil genius and has created a flourishing "trade" of manipulated documents. They create problems for all those concerned with the criminal and civil justice system.

A fraudster commits frauds, via documents in business transactions. Major depredations include:

1. Submitting spurious documents.
2. Using an altered document.
3. Printing counterfeit currency notes, stock and share documents.
4. Credit Cards Frauds.
5. ATM frauds.

7. Reader's Digest (Indian Edition), September, 2014, p 127.

6. Tampering with electronic documents, messages and diverting the contents from the right addressee to someone else.
7. Misappropriation of deposit(s); transferring money from the account of a customer to his account or the account of his accomplice.
8. Depositing the fresh deposit money of the customer to his/his accomplice account.
9. Pledging spurious/inferior/short measure of the pledged goods.
10. Pledging the same goods to more than one person/organisation.

The list goes on.

2. Computers and Internet

Computers and the internet are new genies of the fraud master.

III) Situations

In accountancy, there are many fraud-prone opportunities and situations. Their elimination promotes the prevention of frauds. The following are some such situations:

1. The lax environment (non-observation of rules, the wilful breaking of rules/policies, bypassing control systems.
2. Negligence, incompetence, fraudulent intent.
3. Failure to create and observe healthy transactional policies.
4. Lack of periodic auditing and balancing of accounts.
5. Lack of ill-defined duties of staff.
6. No accountability.
7. Over-trust of individuals.
8. Non-mobility of staff.

Alert management keeps strict vigilance on these (and other) situations and plugs any loopholes.

PREVENTION OF FINANCIAL FRAUDS[8]

Anti-financial frauds mantra:
"Eternal Vigilance"

Financial frauds have acquired frightening dimensions and unfortunately, they are still expanding exponentially. There is an urgent need to prevent them and to deter their perpetrators. The classical methods for fraud prevention also hold good for accountancy frauds (box below). In addition:

1. Hold periodic audit at irregular intervals.
2. Devise a dynamic rotation of staff and transfer policy. No staffer should take roots at one place/post.
3. Involve multiple handlers for important transactions.
4. Know the weak links and provide for their safety.

8. For details see: Sharma BR. 2016, *Bank Frauds*, publisher LexisNexis.

5. Know your staff, customer, partner, associates, important subordinates, service providers. Collect personality profiles of important/doubtful personalities involved in the organisation, covertly, from a Forensic psychologist. He may indicate dubious characters.
6. Keep oversight not only on staff but also on customers, partners, service providers, associates and other involved persons in the business. It helps.
7. Keep a strict check on materials: their arrival, storage, movement, sale, transfer.

Forensics Financial Fraud Antidote

1. Management must realise that they are solely responsible for fraud control. They cannot pass on the buck to others.
2. Use Forensics to recruit honest persons only.
3. Induct periodic honesty angle checks as part of the service rules.
4. Effective oversight promotes efficiency and reduces financial frauds.
5. Real-time monitoring of transactions, regular auditing and balancing of accounts are the key to minimise frauds.
6. A blend of detection and prevention measures, ingrained in an organization's culture, is most effective in preventing financial frauds.
7. Transparency minimizes frauds effectively.
8. Blind over-trust is anti-business practice. It promotes frauds.
9. Identify fraud-prone areas and install anti-fraud system
10. Install whistle blowers
11. **Segregate duties so that more than 2/3 persons are involved in a single transaction.**
12. **Assign responsibility. Induct accountability.**
13. The fraudster must believe exemplary deterrence is round the corner

In short:

Institute reasonable oversight, establish checks and balances, segregate responsibilities, eliminate management overrides, no over-trust, implement proper policy for recruitment/rotation of duties/transfers and ensure exemplary deterrence. And you are there.

CHAPTER 10

DOCUMENTS[1]

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1. For comprehensive and integrative approach to tackle disputed documents handwriting problems, please see the Author's Book: B R Sharma, *Handwriting Forensics*, 2017, LexisNexis.

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A man's writing seems to be part of his flesh and bones; he cannot discard it at Will.

Fig. 10.1

10.1 IMPORTANCE

Documents play an important role in human life. We daily write and sign a number of documents. It may be a personal letter, a receipt, a cheque, or an order affecting the lives of many individuals. If we stop writing or accepting documents[2], the working of modern society may be adversely affected.

The criminal has not been slow to realise the importance of documents. He has been exploiting the potentialities of their falsification. Thousands of forgeries and frauds are perpetrated every year with new modes and methods. Documents form major part of the physical evidence handled by an average investigating officer. Yet, it is estimated that only 50% of the questioned documents cases are reported to the police.

The falsification of financial documents is a "big business" in almost every country and it is on the increase everywhere. It is estimated that thousands of crores of rupees are lost in financial frauds every year.

The art or craft of forgery is not difficult. A little patience, good penmanship, sufficient practice, intelligence and courage to face the consequences are the only requirements. On the other hand, the detection of forgery is comparatively far more difficult. It may be possible to detect a fraudulent document, but the identification of its author is difficult. For example, initials are easily imitated with little chance of detection of the forgery. Erasures, small additions or alterations, likewise, seldom permit the identification of the culprit. Signatures of illiterate or semi-literate persons are easy to imitate. If the forger has written after practice, there is little chance of his identification as author.

Scientific detection of forgery is possible in a large number of cases. However, the courts are wary of accepting the findings of experts as final and sufficient. Most of them want corroboratory evidence in all cases.

A false document is the creation of an educated person. He keeps up with the latest advances and uses them to perfect his art. Consequently, the detection of falsification of documents is difficult and slow.

A businessperson had obtained an advance for the agreed sale of a property from another businessman. The prices shot up. The seller wanted neither to sell the land at the agreed price

2. Paperless society is heading toward the situation.

nor to return the money. He used the most modern way to forge signatures of the purchaser on 30 receipts of money of total face value Rs 40.5 Lakhs!

Modus operandi? *Simple!*

He picked up genuine signatures of the victim from a court file on a digital camera and transferred the same to a computer. The signatures from the computer were printed on the 30 receipts in blue ink. What perfect duplicates! Even the dot and the small spur were clear. However, the perfection of the signatures was the undoing of the culprit's ingenuity and the effort.

1. *There was not a kink different in the 30 signatures.*
2. *Corresponding loops corresponded in dimensions, positions.*
3. *Intra-distances among the various formations were the same.*
4. *Intra-angulations were alike, though the forger had varied the positions of the signature vis-a-vis the typed text on the receipts.*
5. *The blue ink of the forged signatures corresponded to the ink of his computer.*
6. *The thirty signatures superimposed on one another, almost perfectly.*
7. *The model from which the forged signatures were copied could be located. Not only it could be superimposed on the disputed signatures, but the original was of a later date than any of the dates, the various forged receipts carried. (CH)*

The forgery of a document does not come to notice immediately. Often, the falsification is suspected/detected after years when there is no witness to the act and sometimes scientific evidence is also insufficient (faded, mutilated or destroyed) to provide positive proof. The criminal, consequently, escapes punishment.

10.2 NATURE

Section 29 of the Indian Penal Code **(IPC)** defines the term **"document"** comprehensively:

"Document" *The word "document" denotes any matter expressed or described upon any substance by means of letters, figures, or marks, or by more than one of those means, intended to be used, or which may be used, as evidence of that matter.*

Explanation 1

It is immaterial by what means or upon what substance the letters, figures or marks are formed, or whether the evidence is intended for, or may be used in, a Court of Justice, or not.

Illustrations

1. *A writing expressing the terms of a contract, which may be used as evidence of the contract, is a document.*
2. *A cheque upon a banker is a document.*
3. *A power-of-attorney is a document.*
4. *A map or plan which is intended to be used or which may be used as evidence, is a document.*
5. *A writing containing directions or instructions is a document.*

Explanation 2

Whatever is expressed by means of letters, figures or marks as explained by mercantile or other usage, shall be deemed to be expressed by such letters, figures or marks within the meaning of this section, although the same may not be actually expressed.

Illustrations

A writes his name on the back of a bill of exchange payable to his order. The meaning of the endorsement, as explained by mercantile usage, is that the bill is to be paid to the holder. The endorsement is a document, and must be construed in the same manner as if the words "pay to the holder" or words to that effect had been written over the signature.

[s 29 A] "Electronic record"[3]

Electronic record" means data, record or data generated, image or sound stored, received or sent in an electronic form or micro film or computer generated micro fiche.

A document is an object/material, having a symbol or writing on it, which conveys some meaning to one or more persons. The object may be a stone, a wall, a wooden piece, a glass, a metal sheet, and a skin, a piece of cloth, a parchment or a paper. It includes a map, a plan, graph or a drawing, a sketch and a photograph.

Electronic gadgets have not been included in the definition of documents. They should be included. For example, the following gadgets qualify for the inclusion in the definition:

1. Computers
2. Mobile phones
3. A disc[4], tape, sound track or other device in which sounds or other data (not being visual images) are embodied so as to be capable with or without the aid of some other equipment, of being reproduced there from; and
4. Any film, negative, tape or other devices in which one or more visual images are embodied so as to be capable, with or without the aid of some other equipment, of being reproduced there from; "film" includes a microfilm.

In a case of wrongful confinement by the police, the "victim" scratched his signatures on one wall of the cell where he was detained illegally. When he came out, he filed a suit against wrongful confinement. The police denied the charge. His signatures on the wall proved his confinement. (CH)

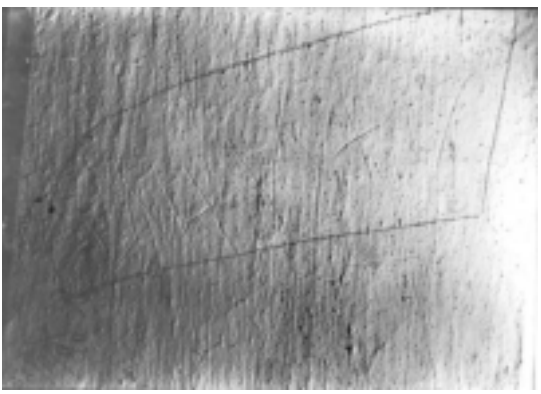


Fig. 10.2
Writings on the wall

In a case of theft, the costly cloth was shipped through railway. It was packed in gunny bags. The culprits (members of the railway staff), on the way, changed the address on the packets. The change in address was detected before the delivery. The culprits responsible for the act were identified through the writing on the bags. (CH)

3. *"Electronic record" means data, record or data generated, image or sound stored, received or sent in an electronic form or micro film or computer generated micro fiche' (vide* Clause (t) of sub-section (1) of section 2 of the Information Technology Act, 2000*).* The words "electronic record" shall have the meaning assigned to them as in clause (t) of sub-section (1) of section 2 of the Information Technology Act, 2000.
4. The Supreme Court has ruled that a compact disc (CD) is a document under section 3 of the Indian Evidence Act, 1872. The Court also held that a CD has to be exhibited/played by the trial court to enable the public prosecutor to admit or deny its genuineness under section 294 of the Code of Criminal Procedure (CrPC).

10.2.1 Letters

A questioned document may be pseudonymous or anonymous communication. It may be a threatening or a suicide letter. It sometimes may contain secret or code writing.

> *In a case of suicide, a letter purported to be written by the victim, contained material that indicated that her in-laws were torturing her. A case was instituted against the husband and the mother-in-law. The husband vehemently opposed the accusation. He was sure that his (late) wife had no cause to write the letter and probably the letter in question was spurious.*
>
> *The husband sent the letter, along with some other letters written by the victim, to the author to check the authenticity of the letter. It was found that his (late) wife (the victim) did not write the letter. However, the handwriting on the letter had close similarities to the handwriting of the deceased. Probably her brother or sister had written the letter. On checking, the handwriting of her younger sister was found to correspond to the handwriting on the disputed letter. (CH)*

10.2.2 Financial Documents

A questioned document may be a money receipt, a money order form, a cheque, a ProNote, a currency note, a payment order, an account book, a bill or a tender.

Fig. 10.3

Fig. 10.4
Forged currency note (top) was compared with a genuine note of the 'same' series (x). The forgery was disclosed by the absence of security thread, water mark (imprint was made in wax!) and defective national emblem

10.2.3 Orders

A questioned document may be an order relating to an appointment, transfer, training, promotion, demotion, increment, allowances or leave. It may be a permit or licence for

purchase, sale or possession of some articles. It may be a passport for travels abroad, or it may be a certificate, a degree or a diploma.

10.2.4 Records

Falsified Records become questioned documents. It may be an office, production, sale or purchase record. It may relate to consumption, stores, confidential inquiry or some report.

10.2.5 Tickets

All sorts of tickets are forged: bus tickets, railway tickets, lottery tickets, the excise stamps, and horse race betting tickets are some of them.

Fig. 10.5
All the three tickets printed with the same block but forged ticket was numbered with different numbering machine. The shape and spacing differences are clearly brought out by the transparent graph plate

In a state lottery, four tickets bearing the winning number were presented to the authorities. All the tickets were printed in the same press except for the serial numbers. Four different numbering machines were used to print the numbers. Three of the four tickets, from the study of the size, structure and spacing of numbers, were forged.

Blank printed tickets, without numbers, had been stolen from the press. (CH)

In a State Transport undertaking unauthorised bus tickets of various denominations were printed on a mass scale and used on various routes by a gang of the transport staff. Comparison with the genuine tickets revealed the forgery. The tickets were also linked with blocks recovered from the suspects. (CH)

A few years ago, some employees of the railway staff ganged up and started selling used tickets by punching new dates on the old tickets collected from the passengers after they had completed their journeys (mostly Amritsar-Delhi tickets). Punches recovered from the accused were identified to have been used to re-date the old tickets. (CH)

Fig. 10.6
A mutilated college fee receipt (left side photo), recovered from the rotten clothes found alongwith a skeleton, established the identity of the victim when compared with the carbon copy (right side photo) found in a college receipt book.
comparison was done with a graph plate

10.2.6 Examination Papers

Degrees and diplomas are of great value to secure employment, promotion and confirmation. The answer books are, therefore, sometimes replaced. Complete paper or some questions are done by some person other than the real examinee and are passed on to the examiner. Sometimes the real examinee is impersonated, and a substitute appears for the examination.

10.2.7 Wills

A Will is a document a person executes to allocate his wealth and property to persons of his choice. The disinherited relatives often question the validity of the Wills. Some Wills are fraudulently prepared. If the deceased is literate, signatures are obtained by deceit or threat on a blank paper. If he is "**sign-only**" person, she/he is made to sign blank paper on some pretext or threat. The paper is later converted into a Will. Such Wills are prepared usually after death.

In many cases, a Will is prepared, and the signatures are forged thereon. If the person is illiterate, his thumb-impression is impressed on the Will even before/after his death or at the time of death.

Once, a multi-millionaire couple lived in a farmhouse. They had no issues. They adopted unofficially their nephew who was also to inherit their property in due course. However, he was in hurry. He killed both, his uncle and aunt. He expected to get their property. He was tried for murder, but he was acquitted.

The deceased had left a Will. It was a typed document. There were no signatures at the end. Nevertheless, throughout the text wherever the testator had used "I" he had written his name with his own hand in brackets. The Will was accepted as genuine by the court.

According to the Will, the property of the husband, in the event of his death, would pass over to the wife (and subsequently after her death, it was to pass to her heir(s). It was proved that the wife died after the death of her husband. The property was transferred to wife's father.

The nephew contested the case at all stages without success. (CH)

In another case, a moneyed man, though of low intellect, was pampered by a "friend" for a few days and a Will was got thumb-printed from the person, which was witnessed by some of the associates of the fraudster "friend".

Soon after the man was found missing. Murder was suspected. The "friend" produced the Will to claim the property. He became the prime suspect. The relatives suspected foul play. Detailed and lengthy interrogation of the fraudster led to the discovery of a partially burnt buried body. The body as such could not be identified, but remains of the thumb gave identifiable prints. The thumbprint on the "Will" was compared with them. RH thumbprint (from the semi-burnt body) tallied with the one on the will. The body was, thus, identified. The fraudster/murderer did not get the benefit. He was convicted of murder. (CH)

10.2.8 Historical Documents

Curio/antique collectors and museum curators are always anxious to get letters, autographs and other documents of historical importance to add to their collection. They pay fantastic prices for important documents (and other objects). The forgers often exploit the weakness of the persons. They forge all type of sellable objects including documents like letters, orders, autographs, diaries, and other documents, purported to have been signed or written by great historical personalities. They often scramble/get handsome "rewards".

The British Archives purchased Mussolini's Diaries. Mussolini was the Italian dictator and contemporary co-war lord of Hitler. The British Archives paid part of the fantastic price and got the diaries. They engaged an historian to check the correctness of the events mentioned in the diaries.

The historian reported that the facts mentioned in the diaries were correct but there was nothing in the diaries, which was not already known.

A suspicion of their authenticity arose. A document expert was employed to check the diaries. The expert found that the paper of the diaries was not manufactured before 1957, as the bleach used for the paper (which gave fluorescence under ultra-violet rays) was not known before 1957. The diaries were, therefore, counterfeit as the dictator had died in the early forties. (CH)

10.2.9 Posters

Some people publish objectionable posters and distribute them. The posters may tend to increase communal hatred, illegally propagate against the government policy, or vilify an individual. Such posters do not carry the name of the printer, the publisher, or the author.

10.2.10 Books

Books containing pornography violate the law. Book piracy violates copyrights. They are questioned documents.

It is possible to identify the printing press where they were printed.

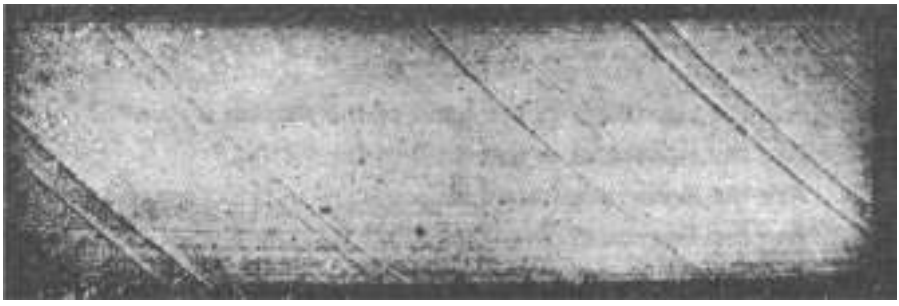


Fig. 10.7
Ghost press is indicated and suspected source identified from guillotine marks on the edge, formed during the trimming of a book

10.2.11 Burnt or Damaged Documents

Burnt documents are found in cases of arson, in accidental fires or in cases where the culprit fears incrimination on the discovery of some offending documents. He destroys them by fire. The criminal often destroys Destruction of financial documents, records, notebooks, diaries or some other types of documents, which may be harmful to his interest.

10.2.12 Electronic Documents

All electronic records are electronic documents. The electronic record has been defined in section 29 A of the IPC as mentioned/discussed above. Fraudulent manipulation of an electronic document is common, and it is increasing.

10.3 DOCUMENT PROBLEMS

Questioned document problems are varied in nature. The important ones include:

1. Identification of handwriting
2. Evaluations of typescript/typewriter/computer printing
3. Examination of writing materials like pen, paper, ink, pencil
4. Matching of seals and stamp
5. Restoration of contents of burnt documents
6. Revealing secret writing
7. Ascertaining the original contents of altered documents
8. Establishing a sequence of strokes in crossed strokes writings
9. Inter-linking/delinking counterfoils and foils *inter se*
10. Fixing common origin of torn paper/letters/other documents
11. Restoration of erased, indented, obliterated, faded writings

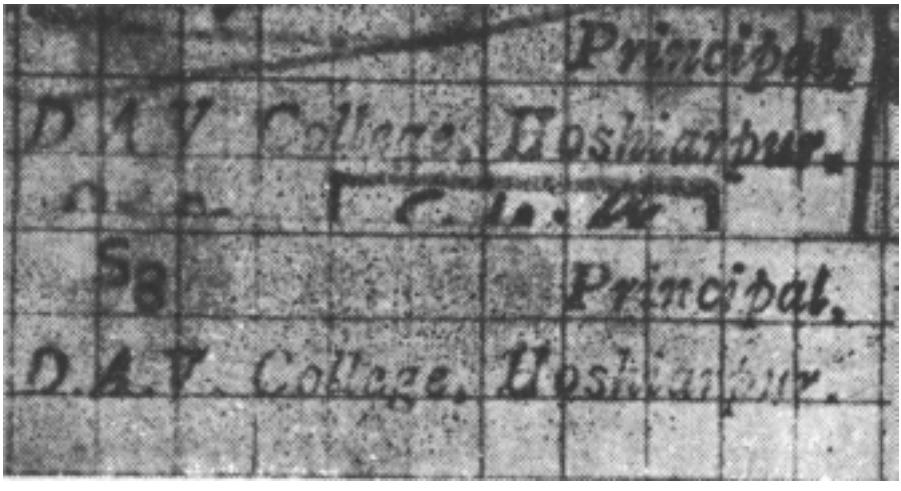


Fig. 10.8
Spurious seal impression matched with the impression from the seal recovered from the suspect

Some tough documents problems, which defy proper solutions, are:

1. Identification of persons who traced and inked traced signatures.
2. Identification of the fraudster who altered/modified a digit or two in the writing
3. Determination of the age of a document, without taggant[5]
4. Identification of a typist from typescript
5. Scored and obliterated writings

10.3.1 Handwriting

Identification of handwriting is the most important branch of document Forensics. It is usefully divided into the following categories:

10.3.1.1 Signatures

1. Are the signatures genuine or forged?
2. Are the signatures in the hand of the suspect?
3. Are the signatures in the hand of the victim?
4. Are the signatures traced signatures?
5. Are the signatures in disguised hand?
6. Are the signatures on the given document transplanted?
7. Are the signatures computer printed?

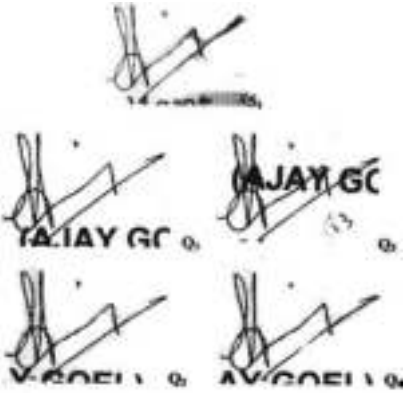


Fig. 10.9
The forger copied the signatures Q_1 to Q_4 from the genuine signatures S1 with a scanner – computer. There are not even the slightest variations, in any aspects – impossible for any human hand to achieve

In an office, there were two peons of the same name. One of the peons did not receive his pay for one month. He reported the fact to the higher authorities. It was suspected that the other peon might have drawn the pay of the complainant.

5. An additive to security ink containing radioactive material. The radioactivity is time-dependent.

The author examined the case. He found that the signature on the revenue stamp was of the complainant. Closer examination revealed transplantation of the revenue stamp.

Previous payment record was checked. It was possible to establish the place from where the signed stamp had been removed. A new stamp bearing the name of the complainant (not written by the complainant) had been pasted at the place. The handwriting on the stamp led to the culprit. (CH)

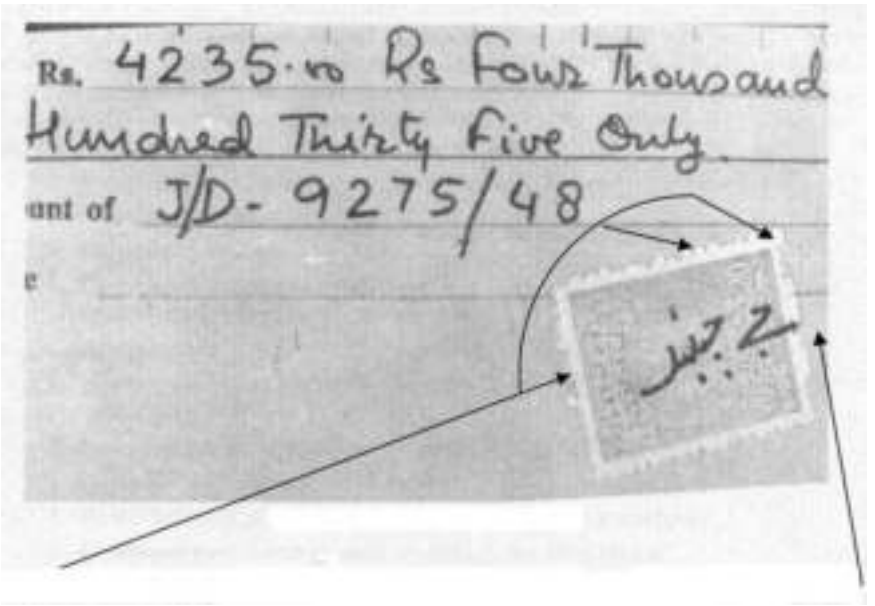


Fig. 10.10
Arrow Head Indicate the Residual Paper from the Previous Document

The document written and signed by one person is called a holograph. The questions asked about the holograph are:

1. Is the document a holograph?
2. Is it written by the suspect or by the victim?

10.3.1.2 Anonymous Letters

The questions asked about the anonymous or pseudonymous letters are:

1. Where has the letter come from?
2. What is the educational calibre of the writer?
3. What is the occupation of the writer?
4. Did one person write the given bunch of letters?
5. Is the suspect the author of the letter(s)?

10.3.1.3 Alterations

1. Were the changes in the document made at the time of writing? Or, were they made later?
2. Are the changes in the hand of the original writer?
3. Are the changes in the hand of the suspect or the victim?

10.3.1.4 Figures and Marks

Figures, hand printing, block lettering; marks may be the questioned writing in some cases. The author of the same may have to be identified.

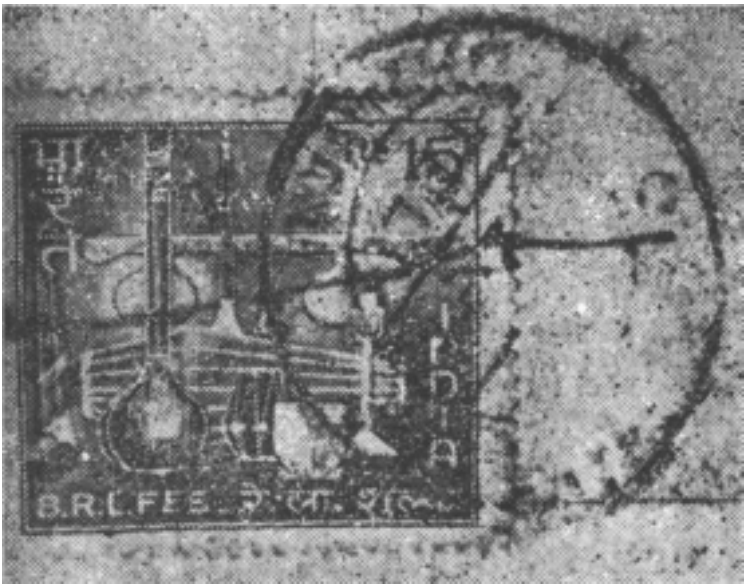


Fig. 10.11
A ticket reused by a postal clerk. the discontinuity of the inner and outer cancellation circles of the stamp is apparent. in addition, dates were also different

10.3.2 Typescript

The typewriters are becoming a vanishing entity. However, they are not completely gone. Computers are replacing them. The problems relating to typewriter/typescript are also the problems of computer/computer prints. They are:

1. Was the disputed document typed on the suspected machine (typewriter/computer)?
2. What is the make and model of the machine?
3. Was the document typed on one or more than one machines?
4. Are there any additions, alterations or substitutions to the original text? If so, were they made on the same machine?
5. Is there any erasure in the typescript? If so, what was the original text?
6. Is the document a true carbon copy of the original document or *vice versa?*
7. What is the age of the given documents?
8. Can the typist be identified?

Fig. 10.12
Manufacturers' variations in letter designs permit easy eliminations

10.3.3 Writing Materials

The preparation of documents requires paper, ink, pen, pencil, blotting paper, carbon paper, and erasers. Sometimes these materials become disputed materials and need evaluations. The raised problems about them are:

10.3.3.1 Paper

The following questions are asked about the paper:

1. Are the leaves of the multi-leaf document alike?
2. What is the age of the paper(s) of the document?
3. Has the surface of the paper suffered alteration?
4. Does the piece of paper form part of another piece of paper?
5. Is the paper similar to the given sample?
6. Does the paper contain any secret or indented writing?

In an appeal against the death sentence, the accused submitted that the paper, on which the sale of potassium cyanide was shown in the sale book in the name of the accused, was transplanted. It was not part of the sale book originally.

The author examined the paper of the leaf and compared it with other leaves of the sale book. The evaluation showed distinct dissimilarities in shade, fluorescence, screen (wire net) print and water marks. It showed a clear case of substitution. The court acquitted the accused. (CH)

Fig. 10.13
The interpolation of a leaf was indicated by the difference in tear patterns of interpolated leaf (central) and of the proceeding and succeeding leaves

In another case, the authenticity of a particular entry in a register was questioned. There were brownish stains on all the sheets of the register on both sides except on the sheet containing a questioned entry, in corresponding position. Evidently, the sheet was planted at the site. (CH)

10.3.3.2 Inks

The evaluation of inks on questioned documents solves many problems:

1. Is the whole document written in the same ink?
2. What is the age of writing?
3. Has the ink come from the given inkpot?
4. Can the faded ink be restored?
5. Can the erased writing be restored/photographed/read?
6. Are the additions, alterations, substitutions and/or cancellations with the same ink with which the main document is written?
7. Can the obliterated writings be made legible?

10.3.3.3 Pen

The following questions are asked about the pen:

1. Is the whole document written with one pen?
2. Are the additions, alterations or substitutions with the same or different pens?
3. Is the questioned writing written with the given pen?
4. Can the seized pen be linked with the given writing?

In a training institution, an instructor started receiving obscene letters. The suspected source was checked, and pen, paper and ink were recovered. The recovered articles along with the handwriting established the authorship of the anonymous letters. The culprit, a trainee, when confronted with the evidence, admitted the writing and left the training institution. (CH)

10.3.3.4 Pencil

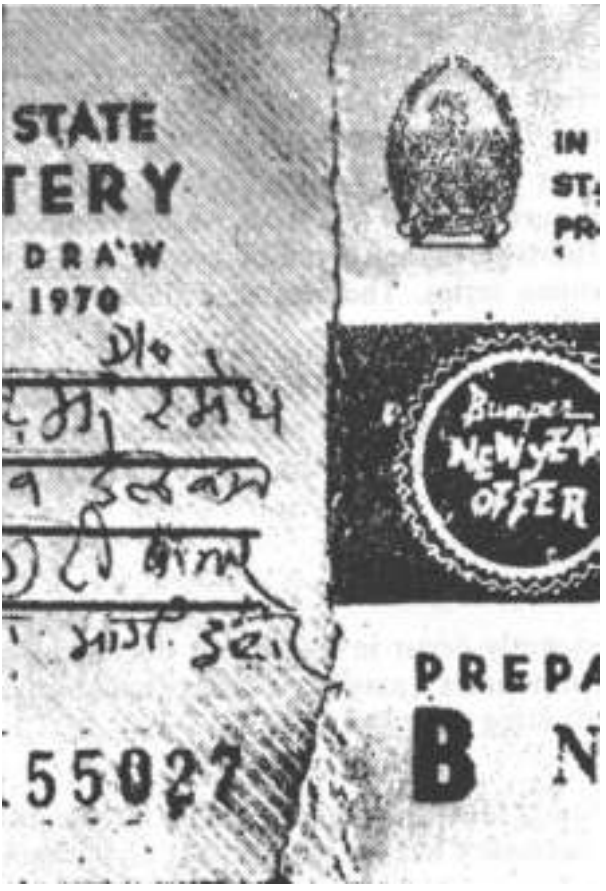
In some cases, it is necessary to find out if the questioned writing is with the pencil recovered from a suspect or not. Likewise, additions, alterations, and substitutions may be made with the same pencil as used to write the original text or with a different pencil. It is useful to establish the fact.

10.3.3.5 Erasers

A criminal may use erasers to remove unwanted writing from a document. Some particles of the eraser are left in the paper. They may permit the identification of the eraser used.

10.3.4 Seals/Stamps/Torn Paper

The comparison of seals, stamps, punches, torn paper pieces, carbon copies, printing blocks, perforations, stubs, watermarks, punched numbers, embossed marks and trademarks is sometimes required. It involves techniques and principles that are used in the examination of tool marks and matching of broken and severed parts of various articles. They have been, therefore, discussed in the chapter on tool marks.



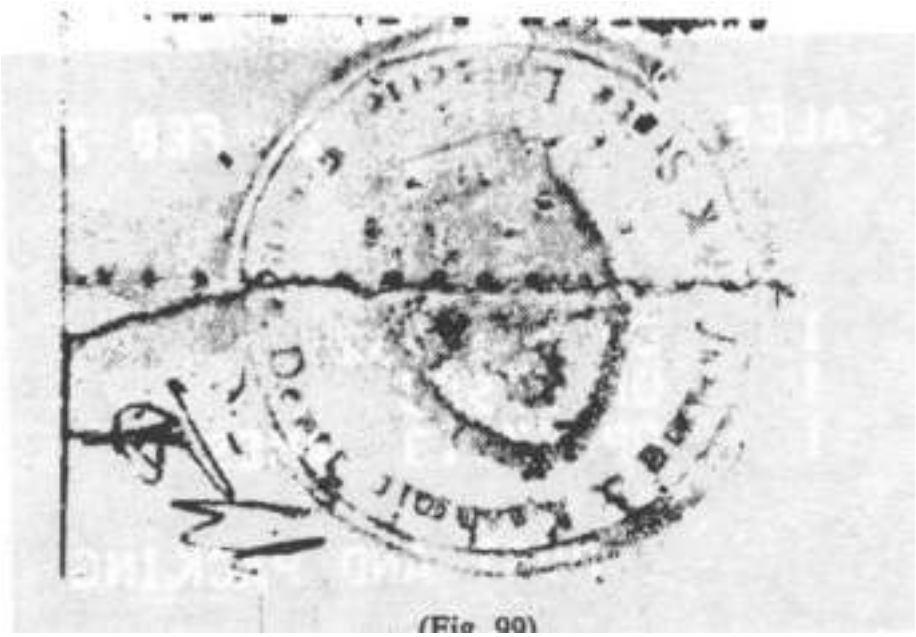


Fig. 10.14
Mechanical fit of the winning lottery ticket and its counterfoil indicated the genuineness of the ticket. the other ticket bearing the same number (forged) did not fit with the counterfoil. the two photos show the two sides of the same ticket and its counterfoil

10.3.5 Burnt Documents

Burnt documents require restoration of the writing. If currency notes are involved, it may be necessary to estimate the amount. If currency notes are of one denomination only, it is easy to estimate the amount.

In a fire in an office, the fire allegedly burned currency notes worth thousands of rupees. When the ashes were examined it was found that only a few hundreds of rupees could be accounted for from the charred remains of one-rupee packets. The correct estimate of the total loss could not be given. (CH)

10.3.6 Secret Writings

Smugglers, spies, and criminals often communicate with one another in secret writing. It is desirable to find out the secret message and to know the code and method of communication.

10.3.7 Miscellaneous

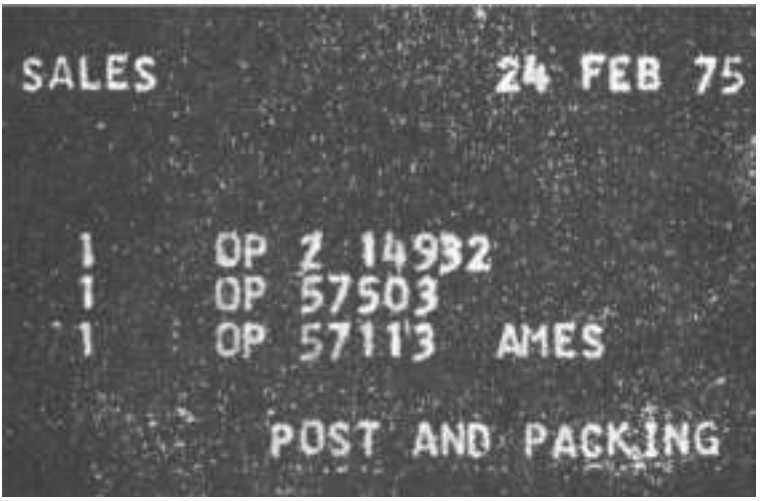


Fig. 10.15
Clandestine sale discovered from the discarded carbon paper recovered from a dust bin in a police raid on the premises of a firm. Transmitted light photography gave out the writing clearly

10.3.7.1 Erasures

Erasures are, sometimes, found in fraudulent documents. It is necessary to find out the original text. Sometimes it may be necessary to identify the erasing material — the eraser or the eradicating chemical.

10.3.7.2 Indented Writing

Indented writing sometimes gives useful information about the questioned documents. It is necessary to find out the text of indented writing. ESDA is the apparatus which is used to reveal the indentedwritings.

> *The source of a series of anonymous letters could not be traced for some time. After a long wait a letter was received on which some indented writing was detected. The evaluation of the same gave a name and a platoon number. When the local training institution was checked, the person with the name and platoon number could be located. Further investigation led to the writer of the anonymous letters. He was a roommate of the person whose name was discovered in the letter in indented writing. (CH)*

10.3.7.3 Sequence of Stroke

The determination of the sequence of strokes is an important task to fix the responsibility of the writer where additions have been made allegedly after the execution of the document.

> *In a government office certain important documents were lost. It was essential to fix the responsibility for the loss. The documents were allegedly handed over by one person to another under signatures. When the peon-book was closely examined, it was found that in the sentence relating to the handing over of the document, one of the lines of a letter had crossed one of the letters in the signature. The crossed line was found over the signature through ESDA. The person handing over the document was held responsible for the loss (theft) of documents and the act of forgery. (CH)*

10.3.7.4 Gum, Adhesive and Sealing Wax

The examination of gum, adhesive and sealing wax is required when it is suspected that a letter/packet were opened by an unauthorised person or not. It is often possible to detect the opening through examination of the new adhesives.

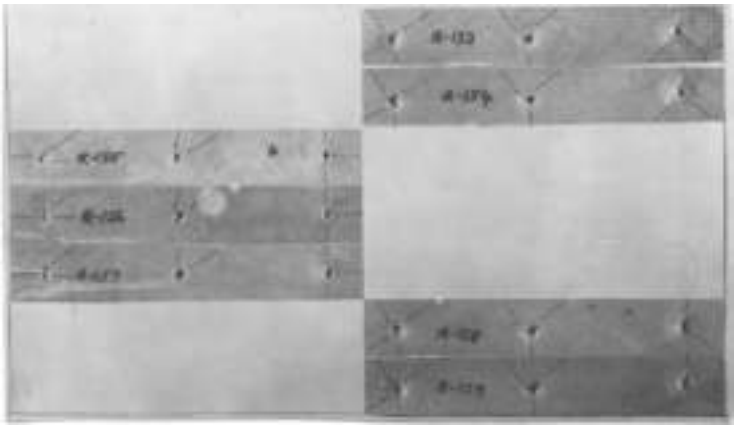


Fig. 10.16
Stich-holes identify the inserted page (3) in between 1 and 2

10.4 LOCATION

Location of questioned documents is not difficult in most of the cases. The document is produced by the culprit or by the affected party. At times, however, where documents are to be collected from a huge record of years in big firms and government offices, the work becomes stupendous. In such cases, help from Forensic accountant to understand the working of the establishment concerned facilitate the location is necessary.

10.4.1 The Victim

Anonymous letters, forged cheques, money orders, receipts, currency notes, permits, ration cards, passports, orders, identity cards, letters of recommendation and the like are with the victim.

10.4.2 The Culprit

The forged wills, account books, permits, ration cards, passports, currency notes, order books, identity cards, historical documents, authority letters and the like are with the culprit.

10.4.3 The Office

Genuine or forged authority letters, records, examination papers, account books, attendance registers, sale and purchase deeds and the like are in the affected office.

10.4.4 The Lockers

It is customary and becoming increasingly so, among the educated and the rich, to keep important documents in bank lockers. It is a safe haven for the corrupt, the fraudster and

the politician/bureaucrats. They hide the documents relating to illegally amassed property and wealth in banks. The bank lockers are becoming an increasingly important source of documents in criminal cases against the corrupt, the fraudster, the smuggler, the money launderer, the drug syndicates, the smuggler and the like.

10.4.5 Other Sources

Questioned posters are found in the affected area. Interception of the post provide secret and spy letters. The mobile and the internet are changing the scenario.

10.4.6 Fireplaces

Burnt documents are found at the seat of the fire. It may be a fireplace, a stove or an open place.

10.4.7 Dustbins

Incriminating documents are torn and thrown away in the open or in dustbins. They sometimes provide important evidence.

Bits of torn documents are collected from wastepaper baskets, dustbins or debris heaps. They are sometimes scattered inside, outside or around the house.

10.4.8 Admitted Writings

*A*dmitted writings are those writings, which a person has written in the ordinary course of work when the suspect/person is not aware that the writing could be used for comparison purposes with a questioned document in some court case. The handwriting is natural/normal. Such writings permit detection of forgery/disguise in specimens.

Admitted writings are essential to evaluate most of the document problems involving handwriting. No effort, therefore, is spared to collect adequate/right admitted writings.

The main sources[6] of admitted writings are:

1. Office where the person is employed. Applications for appointment, leave or loan, acquaintance rolls, pay, fingerprint records, office noting, orders and acknowledgements are important admitted documents.
2. Offices of the utility services: municipal authorities water supply, electricity supply and. Cancelled cheques and specimen signatures are with the banks. Postal records are available with the post offices, income tax returns are found in the income tax office.
3. Alma maters: school, college, university, training institutions
4. Correspondence with friends, relatives, businessmen, associates, insurances, and finance companies, lawyers and the like. *Vakalatnama* is an important source of authentic signatures.
5. Financial transactions, sale deeds, contracts, mortgage papers, lease deeds, sale slips, stock certificates, are good sources of admitted writings.
6. Signatures and other writings, in court case(s)
7. Diaries
8. Notebooks

6. See Appendix B.

In a case of forged Will, standard signatures of the alleged testator were not available. He had contested a property dispute case, some years ago. The record of the case was summoned and the signatures thereon compared with disputed signatures. (CH)

10.5 COLLECTION

10.5.1 Admitted Writings[7]

Contemporary admitted writings are always collected, whenever possible. While collecting admitted writings, one should keep the following points in mind:

10.5.1.1 Admitted documents are authentic

The authenticity of the admitted signatures/writings is paramount. There are proxy signatures sometimes. If such signatures are submitted for comparison, the results will be wrong. Only the proved genuine admitted signatures/writings are accepted as authentic. They are proved genuine by independent evidence/genuinely admitted by the concerned person. Writing/signatures, on official documents, are mostly genuine.

10.5.1.2 Admitted writings are contemporaneous

The admitted writings/signatures 2 should belong to the same period during which the questioned document was executed. Some writings should belong to the periods immediately before and some immediately after the execution of the questioned document, whenever possible.

The handwriting of adolescents, school/college students is in the formative stage. It Undergoes drastic changes later. It is not a suitable standard for comparison with set handwriting of later life and *vice versa*.

Old age/illness/accidents affect the writing abilities of a person. Writings of such persons are not good standards for evaluating writing/signature written as adult and *vice versa*.

Illness and old age sometimes deteriorate the handwriting drastically and quickly.

Standard writings, in such cases, should be as from as close a period to the alleged period of the questioned writings as possible.

10.5.1.3 Admitted writings are "Like"

The "like" documents provide the best standards for comparison. If questioned writing is in capital letters in an anonymous letter, the admitted writings should be in capital letters. Similarly, bills, cheques or forms signed in the normal course, corresponding to the questioned documents, are collected as standards. If the questioned writings are entries or initials in a register, there must be some genuine similar entries in the same or similar registers. They are the standards of choice for comparison.

In a bank fraud, a banker put his initials in token of having received a bearer cheque for depositing the proceeds in the bank account of the customer. Instead, he cashed the cheque at the payee bank. When the customer found that the proceeds have not been entered in his account, he showed the receipt, with his initial to the banker. He denied his initials on the deposit receipt or the receipt of the cheque. Over 900 standard initials were sifted to find "perfect" match to the disputed initials. The initials were collected from:

1. *Attendance registers.*
2. *Rotation of duty order registers.*
3. *Maintenance account books.*

7. See Appendix B: Sources of Admitted writings. Also see: B R Sharma, *Handwriting Forensics*, Publisher: LexisNexis (2017 Edn).

Over 100 initials were located and demonstrated to correspond to that of the suspect, which indicated that he could be the probable writer of the initials. (CH)

If similar admitted documents are not available, admitted writings, which contain all or most of the words, letters, digits, figures and their combinations are collected.

Some persons sign different types of documents differently. For example, they sign letters to their friends/relatives by writing their first word of the name, write their initials and surnames in official correspondence. They usually put abbreviated initials in token of having seen or taken possession of correspondence and put stylish signatures on bank documents or money documents. The corresponding type of signatures is collected as standards for comparison with the questioned signatures. Otherwise, the comparison is often difficult in some cases.

As only the likes can be compared, admitted writings in the same script, the same letter form (small or capital), the same style (letter-printing or cursive writing and the writing written with the same or similar materials (pen, ink and paper) are collected.

10.5.1.4 Standards text writings

Sometimes the standard signatures for comparison with the questioned signatures are not available. In such cases, the normal text writing is used for comparison. It may or may not provide conclusive results. Nevertheless, the standard text is examined and compared with the questioned signatures.

A person pens his signatures more frequently than any other single word or a combination of words. Consequently, he goes on simplifying or modifying the letters and their combinations in the signatures to save time. When the signatures are compared with the letters and words of the text, they look different, suggesting different authorship. It may not be so. Positive identification of signatures is possible in some cases. An adequate amount of written text is used for comparison.

10.5.2 Request Specimens[8]

The following principles are sacred for the collection of request specimens:

1. An expert may fail to identify a questioned writing because of insufficient standards for comparison. A large number of standards have never been a handicap.
2. Only the 'likes can be compared'. Script or symbols must be same. Further, signature is best compared with signatures (same model!); text writings are best compared with similar text and so on.
3. Whenever possible actual text is dictated. If for secrecy/obscenity the same text is not used, a text is thoughtfully prepared. It contains the maximum number of words and important word combinations of the questioned text.
4. Dictation is given at three different speeds, on separate sheets.
   - **At slow speed**: With slow speed the suspect can have time to embellish his writings, if he so desires.
   - **At a fast speed:** The fast speed is important because the culprit shall not be able to effectively hide his handwriting characteristics.
   - **At normal speed:** Normal speed brings out his usual way of writing.
5. If the questioned items are signatures, about 30 signatures are obtained on each of the three different sheets.

8. For comprehensive integrative approach, please see: B R Sharma, *Handwriting Forensics,* chapter 7, Publisher: LexisNexis (2017 Edn).

6. If the material is a long text, selected paragraphs are dictated to get specimen writings on three sheets of paper written at different speeds.
7. The writing speed is controlled through dictation speed covertly.
8. Each sheet is removed immediately after completion.
9. The suspect is told about the style he is to write in, *viz.* cursive, pen-printing, block-lettering or a mixture of all these.
10. He is not shown the original questioned writing,
11. He is not given the text (even typed copy) to copy.
12. The space for writing is important. The specimen writings are obtained on the similar blank format, whenever possible; for example, a blank cheque for cheque, a lined similar blank paper for writing in a lined paper and so on. If printed blank forms are not available, electrostatic copies of the forms provided.
13. Two more sets of similar specimens are obtained on two different dates with intervals of a few days, each time.
14. The spellings and punctuations are those of the subject. They are given the spellings or corrected. They are also minor identifying features of the culprit.
15. It is effective to frame a paragraph describing an event or telling a story, unrelated to the crime in hand. All the essential letters, digits and their combinations in the paragraph are inducted in the text. The subject often gets engrossed in the description and, therefore, forgets to disguise his habitual handwriting.
16. Readymade paragraphs or forms for all situations are not quite effective.
17. No prior notice for taking specimens is given to the subject, if possible.
18. If the questioned writing is block lettering/hand printing, more specimen writings are obtained.
19. Specimens are obtained in the presence of a magistrate[9]. He certifies each sheet to that effect.
20. On each specimen sheet the case information data (FIR No. with date and the name of the police station), the suspect's name, age, health is written.
21. The factors, which are likely to affect the handwriting, such as intoxication, injury or weakness are mentioned.
22. The subject (writer) signs each sheet with date.
23. The investigating officer also signs each sheet with date.

10.5.3 Typescript Specimens[10]

In the collection of typescripts, all the points mentioned above, with needed modifications, are kept in mind. In addition, the following points are noteworthy:

1. If the typefaces are dirty, five sheets of specimens should be obtained before cleaning and five sheets after cleaning the dirty faces.
2. If the ribbon is worn out, five sheets of specimens each, with the worn-out ribbon and with a new ribbon is obtained.

9. Section 311 A of Cr P C (2005 Amendment of the Act) confers powers on the magistrate to order a person to give specimen signature or handwriting. For full text of the section see enacted law (Cr PC)
10. Typewriters/typescripts are a vanishing creed. However, they may come up in some court cases.

3. If the platen of the typewriter is uneven, it does not give even typescript. Two sets of specimens are prepared. Five sheets of specimens are obtained as such. Five sheets are obtained after padding the platen with a few sheets of paper.
4. Questioned typescript is used as specimen text, from the suspected typewriters.
5. If the typed questioned is old, standard admitted typescript of that period and of dates immediately before and after the date on which the questioned document was typed is collected.
6. If the dating of the typescript is required, properly dated typed documents is obtained for an extended period covering the alleged period of the questioned writing. They are available in the office where the typewriter was used.
7. The pressure with which the letters are typed is practically the same with experienced typists, but it varies tremendously with novices. The clarity of formation of letters and spacing vary to a certain extent if the questioned and specimen texts are typed with appreciable pressure difference. Therefore, specimens, typed with different pressures, are obtained. An idea of pressure is obtained from the indentations the typefaces cause on the paper, observed on the backside of the paper.
8. If typed carbon copies are the questioned documents, some carbon copies should be prepared as specimens.
9. The number, make and model of the typewriter, the name of the typist, are put on each typed specimen sheet.
10. The typist puts his name and signature (with date) on each sheet.

Note: *It is preferable/desirable to send the suspected typewriter(s) to the laboratory instead of sending typed specimens.*

10.5.4 Burnt Documents

Burnt documents are found in cases of wilful destruction of documents, arson and accidental fires. They may be partially burnt, carbonised or ash.

Burnt documents are extremely fragile. If mishandled they change into small bits, they are useless for evaluation purposes. Whenever possible, an expert from a forensic science laboratory is called to collect/strengthen/preserve the burnt documents.

Burnt documents are collected in a cardboard box of convenient size. Cotton wool padding is placed at the bottom and the document is gently brought into the box. Additional cotton padding is gently placed at the top.

Sometimes the burnt document is strengthened before collection by spraying dilute solution of polyvinyl acetate.

In collecting burnt documents, one should:

1. Handle the burnt documents to the minimum extent.
2. Collect charred documents or their ashes from different places in separate boxes.
3. Keep away the burnt documents from strong wind.
4. Not straighten the folds.
5. Keep them away from a fan in motion.

Fig. 10.17
Apparently completely burnt record of a firm salvaged to get some useful data

10.5.5 Fragile Documents

Old documents or those exposed to sun, heat, smoke, fumes or action of chemicals become fragile. They need careful handling. In short, they are handled only after strengthening and lamination. Polyvinyl acetate solution spray is used to strengthen them.

The fragile document should not be folded.

10.5.6 Damaged or Torn Documents

A suspect may tear the incriminating documents in small bits, throw them in water closets or chew and eat them if he fears raid and search. If these damaged documents are recovered before complete destruction, it is possible to reconstruct or restore them and find out the contents. The IO takes care to:

1. Dry it at room temperature before packing if the collected document is wet.
2. Collect the pieces of documents from different places in separate containers.

10.5.7 Preservation of Documents

The trials relating to document cases, sometimes take years to complete. The documents, therefore, need careful handling and preservation. One should:

1. **Lamination;** all the important documents are laminated such that only the edges of the plastic sheet are fused.
2. **Photocopies**[11]**;** only photocopies of the documents, in place of the original, are used in day-to-day working.
3. **Minimum Handling;** the documents are handled to the minimum extent. They are not carried in a pocket to avoid damage.

11. An attested (certified) photocopy of a document is a legal substitute for the original for most purposes.

4. **Exposure;** the documents are not exposed to strong light, heat or moisture. Sometimes document have to be preserved in humid climate for a long-time. They are placed in a closed container with some desiccants and anti-mould agent.
5. **Identification Marks;** no identification marks are to be put on a questioned document until it has been processed for evidence. A photocopy is used for identity/ processing after its certification to be being a true copy of the original. However, if an identification mark is to be placed, it must be placed at an inconspicuous place so that the questioned writing or other evidence is not disturbed. When secret writing or erasure is suspected even this is not be done.
6. **Alterations;** the questioned document is not to be cut, trimmed, torn, pinned, punched, tagged or joined by adhesive tape. Even stapling is avoided. When two or more documents are to be kept together, use painted paper clips. Or, put the documents together in an envelope.
7. **Torn Documents;** pieces of torn documents are placed in between two polythene sheets. The writing on both sides can be studied without handling them. An adhesive tape keeps the plastic sheets together.
8. **No New Folds;** unnecessary folding/unfolding is not done, nor new folds are introduced.
9. **Chemical Treatment;** Only an experienced Forensic expert can give chemical treatment to a document on orders of the judge. Chemical treatment brings in irreversible changes. They are undesirable/unacceptable/objectionable.

10.5.8 Legal Possession

Questioned document, like other evidentiary clues, are seized observing all legal formalities: properly recorded in the case diary and recovery witnessed by independent witnesses whenever possible.

10.5.9 Reference Marks

The documents are marked for reference purposes. It is better to have a uniform marking system. The most convenient system to mark the documents is:

1. questioned documents as Q_1 Q_2 Q_3.....Q_n,
2. the specimen document as section $_1$, section $_2$, section $_3$ … S_n and,
3. the admitted documents as A_1 A_2 A_3 … A_n.

The questioned, specimen and admitted documents are kept, at least, in three separate envelopes unless they are all in one register or file. The IO may mark the specimens/ admitted documents. It is desirable that the questioned documents are marked after the expert has examined the document for extraneous evidence including latent fingerprints/ secret writings,

Only the relevant papers, not the whole files, are sent to the examiner. The irrelevant papers (from the point of view of examination) may get lost.

10.5.10 Unusual Circumstances

If there are allegedly unusual circumstances (writing under intoxication, writing while ill, writings of old persons, writing in moving vehicle,) in the execution of the questioned, specimen or admitted documents, the unusual circumstances are mentioned in the forwarding letter.

10.5.11 Transport

The documents are sent to the examiner through a special messenger. In important cases, the investigating officer himself takes the documents to the examiner. If documents are sent through post, railway or motor transport, they should be insured against loss and theft.

10.5.12 Movement of documents

The transfer of possession from one person to another is properly documented in a chain of custody log, attached to the case file. The receiver of the document signs the receipt with date. If they are lost, stolen or mutilated, the responsibility for the negligence/trickery could be fixed.

10.6 EVALUATION

Identification of handwriting of a person is highly specialised. It needs a lot of experience, study, and patience. Never submit the documents to unqualified, self-styled or known dishonest experts.

The identifications are based upon certain principles and detailed evaluation of both class and individual handwriting characteristics.

Handwriting identification and evaluations of other document problems are a time consuming and tricky task. Never push the expert to hurry up as it can lead to erroneous results and hence miscarriages of justice. Likewise, the expert should never hurry to avoid later worry. He should not propel any opinion until he has given three sittings after intervals of days and discussed the process/observations/findings with some other expert (colleague/subordinates/superiors) also.

10.6.1 Preliminary Examination[12]

The preliminary examination of a disputed document case is done to find out if the document case is fit for detailed examination or not. The expert appraises whether the disputed document is:

1. Normal.
2. Free from alterations.
3. Free from trimming.
4. Free from obliteration.
5. Free from the infirmities of:
    - Old age
    - Intoxication
    - Disease

The preliminary examination of the standards helps to find out if the standards are:

1. Authentic, proved to be from the alleged source or accepted by the purported person?
2. Adequate (sufficient)
3. Contemporaneous
4. Disguised or otherwise

12. B R Sharma, *Handwriting Forensics*, chapter 10, Publisher: LexisNexis (2017 Edn).

The preliminary examination, thus, determines the adequacy, authenticity and integrity of all the documents being examined. It is followed by detailed examination and evaluation.

10.6.2 Basic Equipment

The examination of the document, in its totality, needs a long array of equipment. However, for most of the situations (especially for handwriting evaluations) the following pieces of equipment are adequate:

1. A good quality magnifying lens with inbuilt illumination arrangement.
2. A **D**igital **S**ingle **L**ens **R**eflex (DSLR) camera with changeable lenses are meeting most of the challenging situation adequately.
3. A good source of light, with variable intensity and manoeuvrability to throw the light at various angles, is an indispensable necessity.
4. An ultraviolet lamp.
5. A poly lite if possible.
6. An X-ray film examination light box for examination of documents in transmitted light.
7. A stereomicroscope.
8. A transparent graph plate.

10.6.3 Principles[13]

Principles are generic law that has many applications in a field and serves as a foundation for a system. They are based on observation and rational truths. They make it easy to understand the concerned phenomena. Handwriting forensics has many principles including the following:

10.6.3.1 Individuality

The handwriting of a person has a personality of its own which is different from that of any other individual, even from his or her father, mother, sister or brother; son or daughter; teacher or friend. The important principle is:

The handwriting of every individual is unique.

No two persons can write exactly alike.

Writing is a conscious act but repetition, with the passage of time, makes it a subconscious act. The output, to start with, is the sum total of schooling, training, writing experience, environments and occupation in addition to mental, physical and emotional make-up of the person. Later, it is influenced by changes in life. No two persons can have the same mental or physical makeup or same life experiences. Therefore, their writings will always vary.

13. See Appendix A: Brewster on Principles of Handwriting Forensics. Also *see*: B R Sharma, *Handwriting Forensics,* chapter 4, Publisher: LexisNexis (2017 Edn).

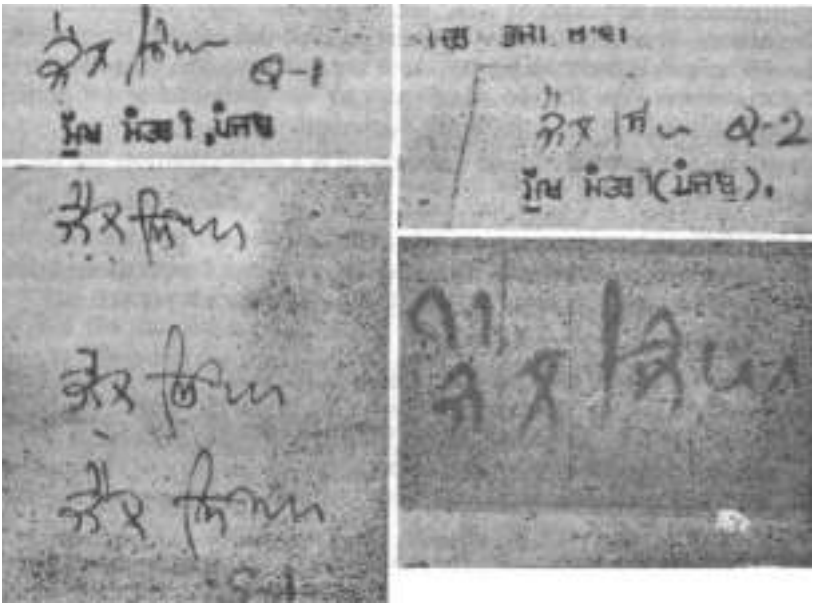


Fig. 10.18
Forged signatures of a Chief Minister, later President, were identified in respect of the forger by synthesizing the 'signatures' of the Chief Minister from the general writing of the culprit. He disguised his handwriting characteristics in request specimens.
S-1 are genuine signature of the Chief Minister

10.6.3.2 Natural Variations[14]

Natural variations in handwriting are subjective. They vary in nature and number with different individuals but the range of variation for an individual is more or less constant, within a range. Natural variations are because our brain does not work like a computer. It gets distracted easily both by the external and internal distractions. Likewise, our fingers, hands and arms are not printing machines to recreate the same writing time and again. Further, the handwriting of a person shows some variations due to:

1. Fatigue
2. Illness
3. Age
4. Writing materials
5. Writing position
6. Physical disturbance (such as movement in a train)
7. Writing with the dormant hand (other than the one normally used)
8. Emotional disturbance
9. Lack of concentration during the writing process
10. Influence of drinks, drugs or both.

14. For a detailed explanation *see*: B R Sharma, *Handwriting Forensics,* Appendix to chapter 4, Publisher: LexisNexis (2017 Edn).

These variations affect the pictorial effect, line quality, size and slant. They do not change the fundamental characteristics. However, with limited writing it may not be possible to identify the writer due to these changes, in some cases.

In guided handwritings, where the hand of the writer is held by someone else, there is little which is identifiable. Guided signatures are the result of the working of two minds. The result cannot be attributed entirely to any of the two writers. The author believes that no expert opinion is possible in such cases.

10.6.3.3 Fundamental Divergences

The identification of common source of two handwritings can be established only if in addition to similarities observed, there are no fundamental divergences.

General similarities are found in persons having been to the same school or their being members of the same family. For example, parents and siblings, brothers, sisters, sons or daughters, may show general similarities. When the writings are examined closely, basic differences are found which permit individualisation of the handwritings.

10.6.3.4 Handwriting Features

The handwriting of an individual is identified by a careful study of handwriting features. They are:

1. General qualities
2. Writing habits
3. Individual characteristics

10.6.4 General Qualities

The following general qualities are noted and compared:

10.6.4.1 Pictorial Effect

The pictorial effect of writing shows the skill of the writer. The handwriting may be clumsy, artistic, forceful, hesitating, laboured, or nervous. A clumsy handwriting indicates little writing experience. The illiterate or the semi-literate writes clumsily. Artistic handwriting indicates artistic bent of mind. Forceful writing is found in persons who write with abandon. Old feeble ill, or illiterate/semi-literate persons show labour (effort, deliberation) in their writing. Most of the forgers show hesitations it is often seen in simulated or traced forgeries. The writings of nervous persons are inconsistent and irregular.

The pictorial effect is the general appearance of the writing. A forger, if he is to succeed, must imitate and create a similar pictorial effect. One, therefore, must not go by super similarities in pictorial effect. "Appearances are deceptive" is literally true in some forged signatures.

10.6.4.2 Rhythm

Educated persons with ample writing experience show rhythm in the handwritings of only. Rhythm is indicated by the flow of the writing, correct line quality and proportionate formation of letters and figures. It is the product of a lot of writing and reading experience and cannot be imitated easily.

10.6.4.3 Style

Style primarily depends upon the initial training, but it is modified according to individual whims/idiosyncrasies and adoption of certain forms that appeal to the particular writer. The writing style may have round, angular or a mixture of the two formations. It may be artistic or simple.

10.6.4.4 Movement

The writing process involves movements of the fingers, hand and arm. The writer may have used the movements of fingers, hand, wrist, forearm, the whole arm or a combination of some of these.

The writing by movement of fingers alone is slow. The size of letters is small. Rhythm is usually absent. School children or illiterate persons generally write with finger movement mostly.

In writing with a hand movement, the wrist acts as a fulcrum. The result is a slow and laboured writing. The pictorial effect is usually poor.

The use of forearm and hand movements for writing is common with most of the writers who write with speed. The writing is smooth and symmetrical.

The whole arm movement writing is produced when the arm does not rest on a support. The writing is usually large and sometimes may be clumsy. The writing on a wall or on a blackboard involves whole arm movement.

Most of the experienced writers combine finger, hand and forearm movements.

Fig. 10.19

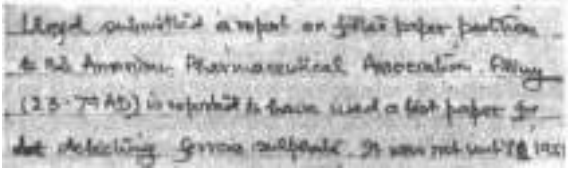


Fig. 10.20

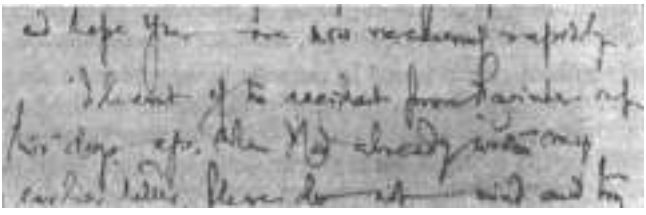


Fig. 10.21

Fig. 10.22
Writers acquire different writing movement habits. Finger Movement (Fig. 10.19) Gives disjointed small-sized writing, hand movement (Fig. 10.20) slightly larger. Forearm movement (Fig. 10.21) gives long and broad writing, whereas whole arm movement (Fig. 10.22) is adopted only when one is writing on the wall or board. Most people combine finger and hand movement with some arm movement

10.6.4.5 Pen Position

The pen is held at an angle to the writing surface, varying from 15° to 90°. Usually it is held at about 60°. The angle of the pen with reference to the base line also varies and is useful in the identification of handwriting. Again, the nib of a pen is held at an angle. Consequently, the nib wears in a characteristic fashion. If the pressure is on the left-hand side, the left part wears more than the right part and *vice versa.* A few individuals may put equal pressure on both the parts of a split nib pen (the pen is now a vanishing creed).

10.6.4.6 Line Quality

The lines written by an experienced writer are smooth and uniform. The starting, finishing and embellishment strokes are natural and smooth. Connecting strokes are uniform and continuous except where the writer habitually lifts the pen to complete or modify the letters.

The line quality, in simulated and traced forgeries, is often poor. There are frequent pen pauses, pen-lifts, kinks and hesitation marks. The lines look laboured and drawn especially at starting and finishing points, connecting and embellishment strokes and on curvatures of certain letters.

The line quality is also poor if the writer is:

1. Weak and feeble
2. Illiterate or semi-literate
3. Unfamiliar with the script
4. Writing with dormant hand
5. Writing in a moving vehicle or in an unnatural position
6. Using a defective pen, paper, ink or writing paper support

Fig. 10.23

Fig. 10.24
In handwriting evaluation the line quality is important. If the questioned writing exists on a stamp (Fig. 10.23), the background shade of the stamp is eliminated by filter photography

10.6.4.7 Skill

The skill acquired by a person depends upon his initial training, writing experience and his physical, emotional and intellectual health/personality. In addition, artistic bent of mind in some persons play the dominant role. It is the sum total of the total writing experience. Once a person acquired graphic maturity, the acquired skill remains with him for a long time. It is inimitable. Because of this, a person with inferior skill cannot simulate the writing of a person with superior skill.

10.6.4.8 Tremors

Tremors are natural in the handwriting of some persons who are old, sick, drunk, or illiterate. These tremors have a pattern of their own. In simulated tremors, the forger is likely to place them at wrong places and the number, shape and size of the tremors are different. The fraudulent nature of the writing can, therefore, be established.

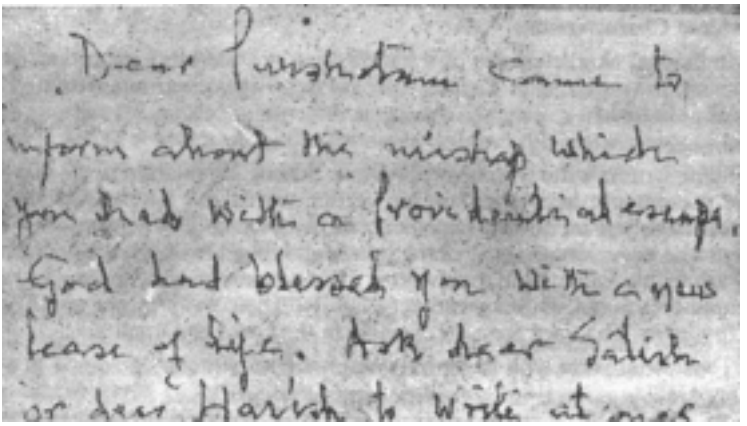


Fig. 10.25
Natural tremors are due to old age, certain diseases, influence of drugs and liquor. Natural tremors cannot be imitated

10.6.5 Writing Habits

Writing habits are formed in the long process of learning and using a language. The following points are noteworthy:

10.6.5.1 Headings

Some writers give headings to their writings not only at the top but to the paragraphs also. The way of introducing and concluding a subject also have personal characteristics.

10.6.5.2 Pet Words and Phrases

Certain words, phrases and sentences are favourite with writers. Their presence, frequency, use or misuse is useful identification clues. They are of some importance in the psycholinguistic analysis.

10.6.5.3 Paragraphing

The habit of paragraphing one's ideas depends upon education and use of the language of the writer. The correct or incorrect use of paragraphs, their frequency and their average sizes are important.

10.6.5.4 Spacing

Spacing of the words in a line, of lines in a paragraph and of paragraphs in a text is valuable points to be studied. Spaces left as margins on the left and the right-hand sides are characteristic of an individual.

10.6.5.5 Alignment

Alignments of writing lines with respect to an imaginary baseline and with other lines, of signatures with the base line and of various lines in an address are distinctive features of a writer. Alignment of letters in signatures, *inter se*, is highly characteristic habit.

10.6.5.6 Punctuation

The shape of punctuation marks, their position and frequency, the choice of a particular punctuation sign, under-scoring and bracketing are important characteristics of the writing habits of a writer.

10.6.5.7 Figures and Abbreviations

The arrangement of figures, use and frequency of abbreviations and the choice of certain letter formations are all products of habits of an individual.

10.6.6 Individual Characteristics

Individual characteristics of handwriting are the most important factors to determine the authorship. They usually survive disguise and simulation in most of the forgeries. They are carefully studied.

10.6.6.1 Pen Pressure

Some writers write with heavy pressure causing indentation in the writing line. Some persons put heavy pressure on certain words and letters only where they sub-consciously want to lay emphasis. Normally a moderate pressure is used to achieve the necessary shading of the letters and to get proper pictorial effect. The lines are slightly indented in such writings. The pressure may be uniform, graduated or impulsive. Some Writers write very lightly. Their writings are usually smooth and rhythmic. The lines are also of uniform thickness and quality.

Those who write with heavy pressure are slow writers.

Illiterate persons ordinarily write with heavy pressure.

10.6.6.2 Shading

Shading in writing may be continuous, graduated or impulsive. Shading varies with different individuals in its occurrence, form, frequency and intensity. Even if a hard nib is used, it is possible to study the shading pattern microscopically.

Shading pattern of an individual is characteristic. It is not easy to imitate it. The forger imitates shading through retouching. A simple microscope reveals the retouching. The natural shading pattern of the forger also appears at different places and proclaims the forgery. Modern writing instrument have decreased the utility of shading as they create limited shade patterns.

10.6.6.3 Pen Pause

Experienced and well-trained writers do not ordinarily pause in writing the letters of a word. Pen pause is natural in the writing of illiterate persons who find it difficult to execute the writing. The pen pause from the forger's pen is different from the pause of an illiterate person though the reasons for the pause are the same.

The pen pauses in a forgery are in the starting stroke, ending stroke, embellishments, at difficult formation and in connectives. The pen pause in genuine writing will be either throughout the writing or only at difficult formation but not in the starting strokes.

The pen pauses deposit extra ink. Sometimes the pen slips leaving some blank or light shade ink gap. Pen slips are identified by this gap. The pen may slip forward or backwards. Pen pauses are easily detected with a magnifier or a stereomicroscope.

10.6.6.4 Pen-lifts

Certain writers lift their pen for certain letter formations in genuine writings. For example, they lift pen to put a dot, to cross a "t", to correct shading by retouching, to complete an incomplete letter or to modify a certain letter in a particular way. In forged writing the forger lifts pen mostly to correct formations, connectives, the pen-lift patterns of the two, genuine and the fake writers, vary consistently. The consistent variations indicate forgery.

If the writer is in the habit of making pen-lifts, the number and positions of the lifts are carefully noted. The number and positions vary in the forged signatures. The positions of pen-lifts in forged writings are sometimes at very unlikely places such as in the starting or the ending strokes or in the embellishments, or at the top or base of a long letter where normally nobody lifts a pen. The pen-lifts in genuine writings are quite conspicuous, while in forgery they are often covered by retouching to give the impression that the writing is continuous.

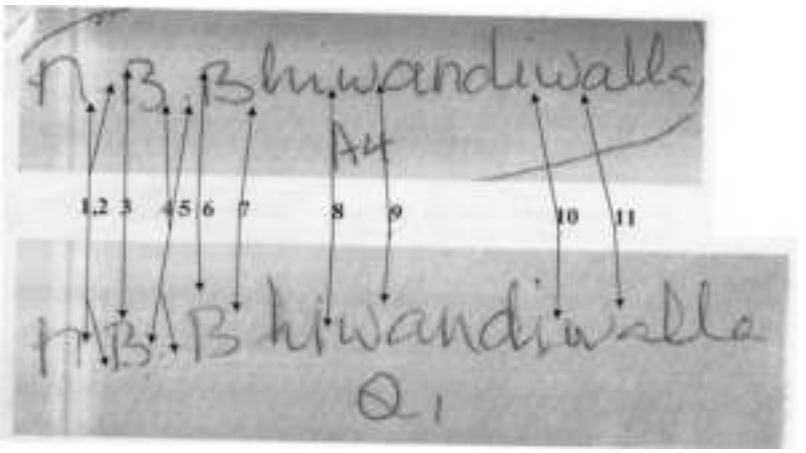


Fig. 10.26
Correspondence in pen-lifts, both in number and positions

10.6.6.5 Starting and Ending Strokes

Experienced writers start writing with a flourish of the pen in the air. When the pen touches the paper, the flourish continues and gives a fine starting line. The fine and tapering stroke is absent in forgeries. Instead, the initial stroke is as thick as the rest of the writing because it is drawn rather than written. Sometimes the starting point is even thicker.

Likewise, the ending stroke of a fluent writer tapers to a fine tip. In most of the forgeries the end points are blunt. The blunt ends are particularly conspicuous in the strokes that end horizontally or downwards.

10.6.6.6 Hesitations

The starting and ending strokes in a forgery show hesitations through tremors or lack of firmness. When a forger starts a forgery, he is not certain whether he will be able to do the job

efficiently or not. Hence, the hesitation is observed in the starting strokes. When he reaches the ending stroke, he is worried whether he has been able to forge the signature well or not. In contrast, in genuine signatures, these strokes are done rather more freely than the rest of the writing. Therefore, hesitation in these strokes indicates forgery.

Hesitations found in vertical lines, in curvatures, loops, ovals and bulbs also indicate forgery.

10.6.6.7 Retouching

Genuine retouching in writing is done to complete, clarify or to produce a pictorial effect in some letters. There is no effort to hide it. Fraudulent retouching in writings, on the other hand, is intended to imitate the shading pattern of the genuine writer or to hide pen-lifts or pen pauses. The two types of retouching are, therefore, easily distinguished. Fraudulent retouching is good evidence of forgery.

10.6.6.8 Embellishments

Certain writers improve the pictorial effect of their writings, particularly signatures, by embellishments (also known as rubrics) through extra non-functional strokes. They are flourishes of the pen. These embellishments are peculiar to a writer.

The embellishment strokes are observed in the starting or in the ending of letters or with the underscoring line after the signatures.

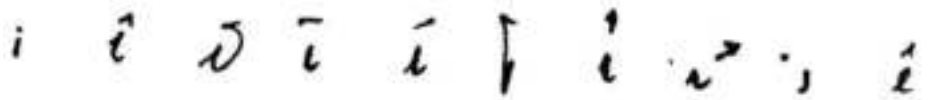
10.6.6.9 Abbreviations

Experienced writers consciously or unconsciously start simplifying letters and words which they frequently write. Sometimes the simplification is so peculiar that it is a highly characteristic feature of the handwriting.

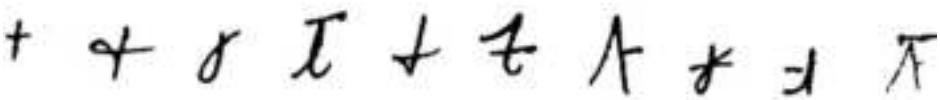
Simplification of signatures is a continuous process. It is possible sometimes to estimate roughly from the simplified pattern the period of the signatures, provided admitted signatures are available in sufficient numbers for an extended period, covering the questioned period.

10.6.6.10 Placing

The positioning of dots, crossing strokes and placing of punctuation marks are highly characteristic of an individual. The placing habit is observed in a sufficiently large amount of writing. In one or two freak instances, the placing patterns differ even in genuine writings.



Variations in (i) dottings



Variations in (t) crossings

Fig. 10.27
Dot and cross bar patterns

10.6.6.11 Slope

Most of the forgers try to change the slant of their genuine writing when they try to disguise their handwriting or imitate the handwriting of their victims. He may succeed in the effort, if the questioned writing consists of a few words only. But in extended writing the forger reverts to the habitual slant. He is seldom able to change the degree of slant substantially. Besides he fails to create consistent slants in different letters. Consequently, the varying slants in the writing offers an inconsistent pictorial effect. There is a mixture of various slopes in different letters or in the same letter at different places.

Slants of the staffs of the tall letters ("f", "g", "h", "j", "k", "p", "q", "t", "y") are studied/measured.

10.6.6.12 Size

The relative sizes of letters and words become almost fixed with the passage of time with a writer. The length, breadth and size of the curves of various letters and words are personal characteristic features. Even if a disguise is tried, the ratios of the length and breadth of letters and words remain constant. The comparison of the ratios is useful to detect forgery.

10.6.6.13 Connective Strokes

Like pen-lift, joining of letters *inter se* is high characteristic habit. Length, shape, and positions of joining sites characterise the writer.

The signatures in free hand forgeries are ordinarily larger than the genuine signatures.

10.6.7 Language

Document experts use certain terms to describe formations of letters and parts thereof. It is useful to know these terms. There is nothing technical or difficult about them. They are convenient to clarify handwriting evidence.

1. **Angular hand**. When the formations of letters are angular, having arms of an angle or a semblance thereof (as against round curves in round hand), the handwriting is said to be angular.
2. **Arc.** A curved line in a letter (*e.g.,* round bottom of "l") is an arc.
3. **Beard**. Beard is the starting embellishment stroke.
4. **Body**. The main portion of a letter, word or a text is its body. In a letter it is the letter without the initial and ending strokes.
5. **Buckle**. A small loop or oval made in a letter *(e.g.,* middle loop of "k") is called buckle.
6. **Bulbs**. A small circular enclosure like one at the end of letter "b" is called bulb.
7. **Connective Stroke**. The line joining two letters is called the connective stroke.
8. **Feathering**. Spreading of the ink on the paper is called feathering.
9. **Foot**. The portion of a letter resting on the base line is called foot of the letter.
10. **Graduated or explosive shading**. When the shading in a letter increases or decreases gradually it is called graduated shading. If it is irregular, it is called "explosive shading'.
11. **Hiatus**. When ink is missing from a portion of a continuous line, it is called hiatus. It is either due to pen lift, ink failure or due to the pen jump.
12. **Hook**. Hook is a hook-like formation at the beginning/ending of a letter.

13. **Loop**. The closed oblong curve in a letter, such as upper parts of "l" or of "h" is called loop.
14. **Oval and "'Eye"**. Closed oval-shaped formation is called an oval. The inside of oval/loop is called 'eye'.
15. **Retracing**. When a stroke is superimposed on a previous stroke by bringing back the pen over the line, the process is called retracing.
16. **Round hand**. When various letters are written without bringing in sharp angles, the handwriting is said to be round.
17. **Shoulder**. The upper portion of a curved letter *(e.g.,* curved portion of letter 'm') is called its shoulder.
18. **Spur**. An ending stroke is called a spur.
19. **Staff.** Staff is a long vertical stroke in a letter.
20. **Wedge**. A wedge like formation in a letter *(e.g.,* crossing stroke of "t") is called wedge.

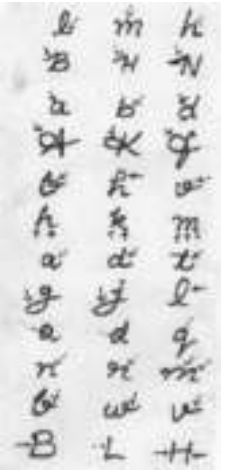


Fig. 10.28
Letter peculiarities: shapes and their nomenclature

10.7 SPECIFIC PROBLEMS

10.7.1 Simulated Forgeries

Simulated forgeries, also known as copy/free-hand/imitation forgeries are those in which the forger tries to imitate the handwriting of another person—the victim. They are practised to forge mainly the signatures of the victim. The success of the forger depends primarily on his education, artistic skill, patience and practice. It also depends partly upon the victim. If the victim is illiterate or semi-literate, his writings are easy to forge. If the design of the writing (even of an educated person) is simple, the writing is more readily forged than when the design of the model signature is complex. If the penmanship of the victim is of higher skill, it is more difficult to forge his writing.

The amount of questioned writing is an important factor in simulated forgeries. It is comparatively easy to forge initials of a person; it is also easy to add one or two small words or digits to a text. Short signatures are easily imitated while long signatures are difficult to forge. It is almost impossible to forge a long text and it is not usually attempted. Hitler's diaries were created but his handwriting was not imitated.

In free hand forgeries, the forger suppresses his own handwriting characteristics, learnt and practiced for decades and adopts the handwriting characteristics of another person who has also writing experience of decades. Both have acquired graphic maturity which becomes part of human nature. It is an extremely difficult task to unlearn his writing experience/mode of decades and learn mode of writing of an accomplished writer in a short period without much experience/practice. He succeeds only to a limited extent. Usually he is able to produce only the caricature of the signature. It is often enough to deceive the layman including the victim. The expert, however, is able to detect the forgery in most of the cases.

A simulated forgery is copying an available model or from the mental picture of the model signature. The forgery from the mental picture is poorer and hence it is easier to detect.

A perfect forgery is impossible. It is a myth

A forgery can never be perfect. The feeling of guilt, the fear of failure and the possibility of punishment is always lurking in the mind of the culprit. It creates mental and physical tension. Therefore, even when the culprit has perfected the art of copying and amount of writing he is copying is small or the writing being copied is of higher skill, some lacunae remain in the forgery. They pop out before the eyes of the expert with/without instruments of an expert. He is able to identify the simulation forgeries in most of the cases. However, generally, it is not possible to identify the forger from the simulated signature, because the signature, writing most of the time is a hotchpotch mixture on distorted handwriting characteristics of the victim and the forger.

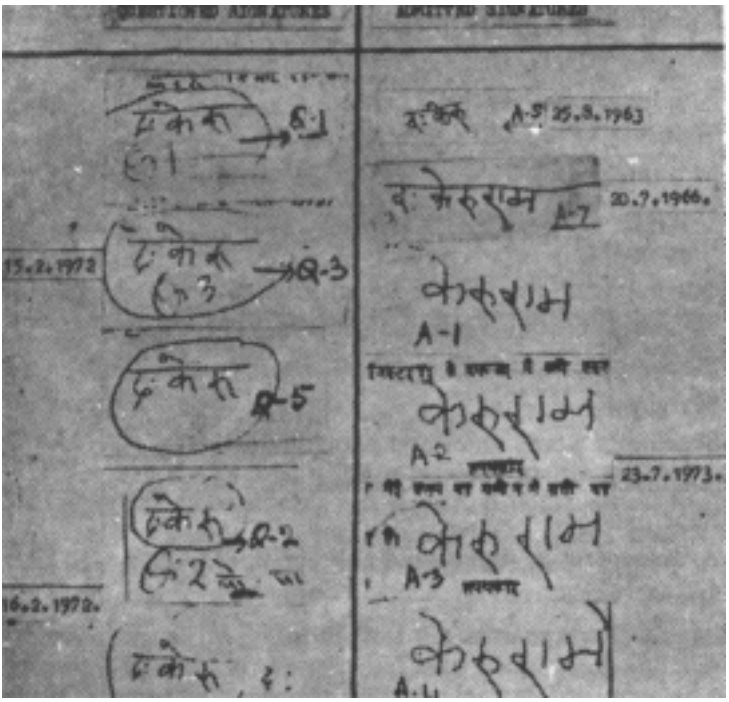


Fig. 10.29

Simulated forgery fails to click. Forgery of signatures involves a double process for success. The forger must discard all his own writing habits of two decades or more and at the same time assume the unfamiliar habits of over two decades of another writer, the victim. The perfection is not possible. Forgery can generally be detected because of differences in habitual skill, formational style, size, proportions, emphasis, etc. Simplifications, speed of writing, firmness of writing strokes, pattern of shading, degree of skill, fundamental muscular movement and co-ordination, rhythm, continuity, pen position and freedom in writing, which affect line quality, alignment, placings, pictorial effect etc. They are very well demonstrated in the above questioned and admitted signatures. The culprit has failed to copy the handwriting of the victim convincingly

10.7.2 Simulated Forgery Indicators

The following features of the document indicate simulated forgery:

1. Same model for all the disputed signatures
2. Drawing-like unnatural appearance: no rhythm, no speed, no abandon
3. Thick/abrupt start/end points.
4. Defective line quality with kinks, bends, pauses, hiatus, defective curves/loops/crests/troughs.
5. Careful retouching
6. Corresponding pictorial effect but not quite alike
7. Inconsistent sizes, shapes slants and curvatures of various letters and formations.
8. Selection of the wrong model for forgery.

The principles and the identification features of a forgery of handwriting have already been discussed above. They are summarised here.

The principles are:

1. Every handwriting has individuality. No two persons can write alike exactly alike.
2. There are always natural variations in the writings of a person.
3. Inconspicuous features have greater identification value and hence greater importance than gross features.
4. Two writings, written by the same person, do not have fundamental divergences.
5. The forger, for disguise, introduces variations in slant but he cannot sustain them in any extended writings.
6. It is not possible to identify the forger in all forgeries.

General qualities of handwriting are:

1. Pictorial effect
2. Rhythm
3. Style
4. Movement
5. Pen position
6. Line quality
7. Skill

The writing habits of a writer are found from:

1. Headings, introductions and conclusions
2. Paragraphs, their frequency and size
3. Margins
4. Spacing in words, lines and paragraphs
5. Alignment in lines, words, letters,
6. Punctuations
7. Arrangement of figures and abbreviations
8. Speed

The individual characteristics are studied from:

1. Pen pressure
2. Shading
3. Pen pauses
4. Pen-lifts
5. Starting and ending strokes
6. Hesitations
7. Retouching
8. Embellishments
9. Abbreviations
10. Placing
11. Slope
12. Size
13. Intra and inter letter size proportions.
14. Emphasis, marginalization, simplification

10.7.3 Genuine Signatures[15]

The hallmarks of genuine signatures are:

1. They are written with speed/abandon. The writer may
   - Miss certain formation.
   - Introduce new forms.
   - Make conspicuous corrections, if any.
   - Write start/end strokes with a flourish.
2. The writings of an experienced writer, in good health have rhythm. It is absent in the writings of semi-illiterate/old/ill/feeble persons. Rhythm may/may not be absent in writing of person under the influence of liquor or drugs.

   In a case a person was so addicted to drinking that he could write properly only when he had consumed liquor; otherwise his hand would quiver. (CH)
3. The lines curves, ovals, bulbs, are smooth.
4. There may be subconscious emphasis on certain formations.
5. The writer is not a stickler to one model.
6. The release of pressure is graduated.
7. There are abundant natural variations but within a range.
8. The slant, alignment and letter proportions are consistent.
9. The marginalisation's and simplifications of certain formations are consistent.
10. The patterns of pen-lifts, crossings, embellishments, are consistent
11. The dimensions of the various writing units correspond *inter se*.

15. For a detailed discussion *see* BR Sharma, *Handwriting Forensics*, 2017 Edn, Publisher: LexisNexis, chapter 14.

10.7.4 Traced Forgeries

From an expert's point of view, a traced forgery is the crudest forgery. However, a good traced forgery can easily mislead a nonprofessional. There are quite a few cases, in which neither the victim nor the IO suspected tracing. The expert revealed the forgery.

The forger needs a model for a traced forgery. Once he has selected the model, he employs any of the following techniques:

10.7.4.1 Carbon Copy Tracing

A carbon paper is placed over the document on which the signatures are to be duplicated, the model signatures are placed over the carbon paper. A dry pen, stylus or any other pointed device is moved along the outline of the signatures with some pressure. A carbon copy of the signatures is obtained on the document. The carbon outline thus obtained is inked to complete the forgery.

Fig. 10.30
Forgery by tracing, using a carbon paper is more frequent than the other tracing techniques. It is the easiest to detect. Carbon outline and carbon particles at places can be easily seen through a magnifier or a microscope

10.7.4.2 Indent Tracing

In this technique, the model signature is placed over the document to be forged. A dry ball pen or similar device is moved over the signatures with pressure. An indented outline of the signature is obtained on the document being forged. It is inked and the forgery is complete.

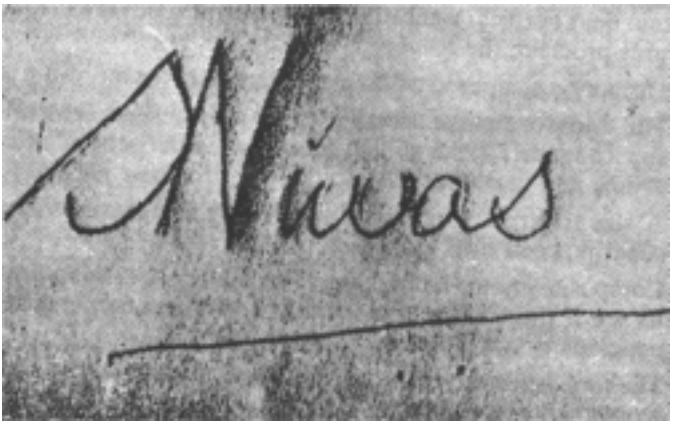


Fig. 10.31
Inking of an indented outline of signatures is another technique for traced forgery. It is also comparatively easily identified. Uncovered indentations at places and canal like depression under the inked portions reveal the indentations

10.7.4.3 Tracing Paper

The model signature is first traced on to a tracing paper. The tracing paper is then placed over the document being forged. A hard-pointed pencil is used to retrace the outline of the signature onto the document being forged. An indented impression obtained is inked and the forgery is complete, as above.

10.7.4.4 Transmitted Image

If the document to be forged is placed over the model signature, on a glass-topped table and strongly illuminated from below, a shadow outline of the signature appears on the document. The outline is inked.

A windowpane can replace a glass-topped table if necessary.

The dimensions of the signatures can be varied by projecting the model signature on to the document being forged through a photographic enlarger. The image formed on the document is inked as in transmitted shadow.

10.7.5 Identification of Traced Forgeries

Traced forgeries are identified easily from the following special features:

10.7.5.1 Model

The culprit may have used a wrong model. It may be an old or a recent model. It does not belong to the alleged period of disputed signatures.

10.7.5.2 Trace Residues

If any of the first three methods were used to trace the signatures, the traces of carbon deposits or indentation outline inside or outside the ink line, detected under a stereomicroscope, indicate traced forgery.

10.7.5.3 Duplication

The traced signatures are replicas of the model signature chosen. If the questioned signatures have identical dimensions with another signature, it is replica of the latter signature. It is, therefore, a forgery as no person can write anything twice exactly alike.

In the evaluations of initials/small-sized signatures of one has to be careful. The writing habits of a person are so fixed that deceptive near perfect duplication may be achieved.

One of the following methods is used for dimensional comparison of a traced forgery with the suspected model:

- The two documents are adjusted in transmitted light until the signatures/writings are one over the other. If they superimpose, it is forgery.
- A size-to-size transparency of the questioned signatures is prepared and placed over the suspected model. If the transparency superimposes, it is a forgery.
- A composite photograph of the forged and model signature is prepared. If the various projections (nooks and corners) correspond, it is forgery.
- The forged signatures and the model are placed one above the other and covered by a glass/transparent plastic graph sheet. Positional correspondence of the various writing units/features indicates forgery.

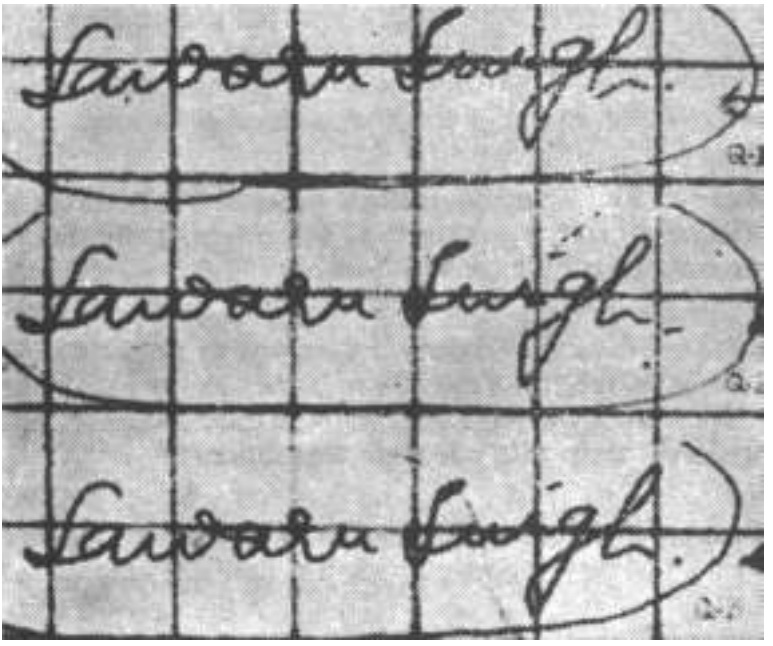


Fig. 10.32
'No person signs twice exactly alike' is well-established principle to establish traced forgery. Graphic comparison of the three questioned signature show 'almost' exact identity of the dimensions, which is possible only in traced forgery

In traced forgeries handwriting characteristics: movement, line quality, crossing and dotting, pen-lifts, shading, retouching and punctuations are not normal and, therefore, they are not used for the identification of the forgery.

The factum that the given signatures are a traced forgery is established in most of the cases. However, it is not possible to identify the forger through handwriting evaluation. The recovery of tracing paper, the model or the carbon paper carrying the model are likely to prove useful to link the culprit with the crime. The beneficiary of the forgery is the prime suspect!

10.7.6 Computer based Forgery

Computer has come up as a top gadget to produce "**perfect**" forgeries. The images of the model signature are picked up through:

10.7.6.1 Scanning

A scanner (of a computer) is an instrument of choice to copy the signatures of a person. A scanner picks up the digital images of the targeted signatures and stores them in a computer. The image is printed on the document being forged in any colour/size. The process gives high quality imitation.

10.7.6.2 Digital Photography

Digital photograph provides a "perfect" duplication of any signature/writings. The picked-up signature are printed on any document, any number of times, in any size/colour through a computer.

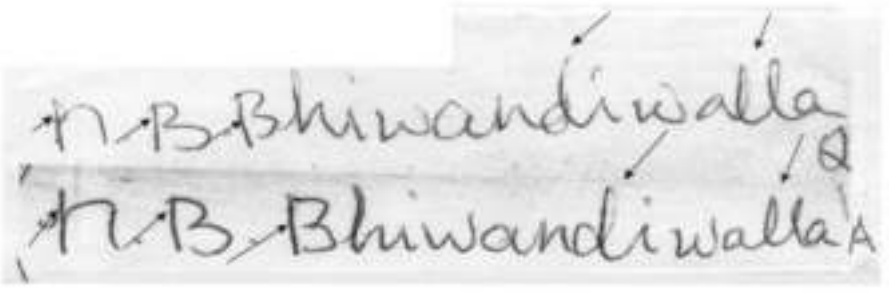


Fig. 10.33(a)

Fig. 10.33(b)

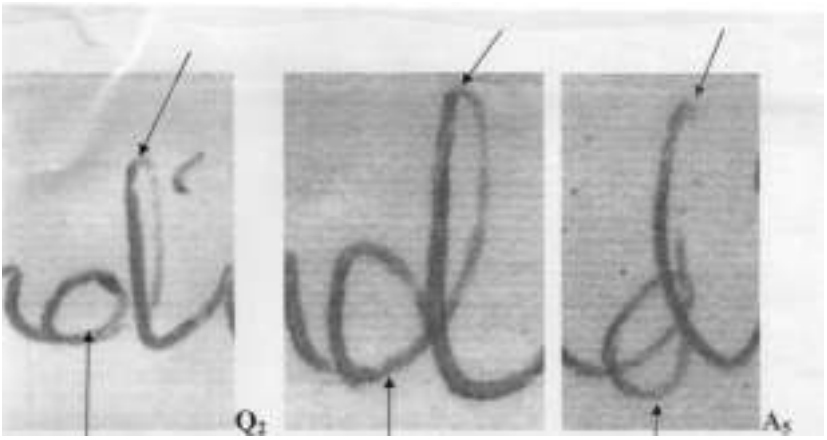


Fig. 10.33(c)

Fig. 10.33(d)
Digital photography in action; top: comparison photograph; (b), (c) and (d) are corresponding segments

10.7.7 Disguised Handwriting[16]

A dishonest person may sign or write a document with the prior intention to deny it later. He writes or signs in disguised hand in such cases.

Disguise is a special kind of forgery where the forger and the 'victim' of forgery are one and the same person. Here the disguiser modifies his usual handwriting characteristics to prevent his identification from the disguised handwriting.

10.7.7.1 Characteristics

A forger makes one or more the following changes to disguise his handwriting:

1. He varies the slant of the writing. Often it is inconsistent.
2. He changes the size of the letters, words, figures and punctuation marks. He is unable to maintain consistency in sizes also.
3. He adopts alternative forms of letters, the other ones than the ones he commonly uses. Frequently he is inconsistent and uses both forms.
4. He simplifies letters and words.

16. For details, see: BR Sharma, *Handwriting Forensics*, chapter 16, Publishers: LexisNexis (2017 Edn).

5. He increases legibility/illegibility of his writing by changing the speed.
6. He uses capitals and small letters indiscriminately. He also changes the shape of the capitals.
7. He adopts pen printing and block lettering.
8. He avoids paragraphing, punctuation and correct spellings.
9. He introduces tremor in his writing.
10. He writes in circles, curves or upside down or *vice versa.*
11. He writes with a dormant hand. The pictorial effect is drastically changed.
12. He introduces/eliminates rubrics (flourishes) and embellishments in the capitals.
13. He changes the pictorial effect of signatures.
14. He uses different embellishments.
15. He uses slow speed in writing. It lacks rhythm.
16. He uses abnormal spacing.
17. He adopts grotesque designs for letters and other formations.

Disguise may be successful when the questioned writing is small in a document. For example, it may be possible to hide one's handwriting characteristics in one or two letters (like initials/ small signatures). However, it is not possible to maintain disguise in a long text. One's personal characteristics, acquire over a decade, pop up there now and then. This is because:

1. It is not possible to writing habit/skill forms, acquired in a lifetime. Decades of writing experience! Engrave them in his brain/mind.
2. The forger does not know the nature of the main identifying features. He makes changes in apparent pictorial effect or in capital letters, but basic inconspicuous individual characteristics remain.
3. The belief of the forger that change from small to block lettering and *vice versa*/ adopting pen-printing/using the second (dormant) hand instead of the usual hand in the execution of the fraudulent document, will hide his personal writing characteristics has no basis. The changes change only the pictorial effect. The form adopted by him bears the imprint of his personality and gives him up if suitable standards for comparison are made available.

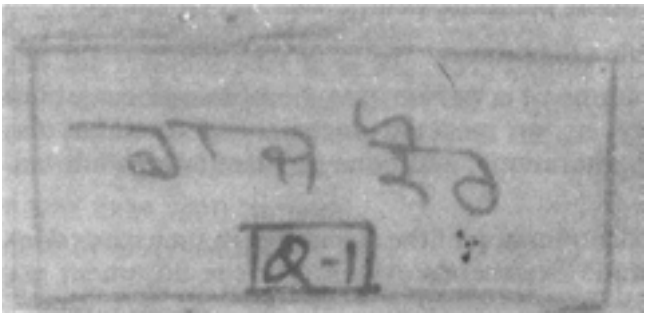


Fig. 10.34

Fig. 10.35
Better skill in signature Q1 vis-a-vis the admitted signatures A1 and A2 proclaims Q1 as forgery, beyond doubt

10.7.7.2 Identification of Disguise/Disguiser

Disguise is easily identified if the disguised text is considerable and normal admitted writing is available in sufficient quantities.

Disguise and Disguiser are identified from the following:

- The changes in letter or other formations indicate disguise.
- The inconsistencies in slant size, forms,, are the hallmark of disguise. He is aware of them. He keeps them out of his consideration for the identification/non-identification of the author of the disguised writing.
- Inductions, eliminations or changes in abbreviations, simplifications embellishments or underscoring strokes indicate disguise.
- The handwriting of the unchanged words permits the identification of the writer.
- There is evidence of conflict between the new style (in disguise writing) and his normal writing style in the same disputed text in patches (left undisguised text inadvertently). The culprit tries to hide his normal characteristics, while habits and set mind pop them up to the forefront. The conflict is evident from the haphazard pictorial effect of writing, the presence of different slants in the same writing (even in the same letter written at different places), and different designs adopted for the same letter in the same or similar words.
- The culprit is conscious of the disguise. The writing, therefore, is slow, drawn, irregular and inconsistent. There are frequent hesitations, pen-lifts, pen pauses and patching. Patches of undisguised text are left in the document.
- The disguise is usually limited to capital letters, slant and pictorial effect. The remaining identification features remain intact. They permit the recognition of the disguise.

10.7.8 Forgery over Genuine Signatures

The genuine signatures of a person may be obtained on a blank paper in good faith or by trickery, or, an innocent document of no value may be changed by trimming, erasures, alterations, additions or substitutions into an important document.

Fig. 10.36

Fig. 10.37

Fig. 10.38

An interesting case. Fig 10.36 is the photograph of a receipt presented by the culprit of having delivered goods. The piece of paper of this receipt was cut from an ordinary letter given to the culprit in routine. The carbon copy of the letter could be located and the relevant part is in Fig. 10.37. Fig. 10.38 is the superimposed photograph of the original Fig. 10.36 and its carbon copy Fig. 10.37. It left no doubt that the receipt was spurious

Handwriting identification of the signatures in such cases does not prove useful to establish the fraud. Extraneous evidence on the document may, however, lead to useful results:

1. The dimensions of the paper may prove to be different than the normal size.
2. The edges are found trimmed.
3. The paper surface carries erasures.

A matriculation certificate had altered name, role number and marks. Only a few digits relating to the original roll number could be figured out. Further check with the official records led to the original owner of the certificate. (CH)

4. The writing is in two different hands. If it is typewritten, it may have been typed on two different machines. Even if the typing has been done on the same, re-insertion can be detected.
5. Two pens may have been used.
6. The writings may be crowded at relevant places.

   In a receipt, the amount and the reasons for payment were subsequently written in the margin. The added text was in continuation of the first line. The margin space was un-used in other lines. (CH)
7. Crossed strokes provide a clue to the sequence of writing.
8. Seals and stamps may be forged.
9. The feathering of ink across a fold on the document indicates fraudulent additions.
10. The date on which the fraudulent document is executed should be checked to ascertain whether the victim was at the alleged station or whether he was capable of executing the document.
11. Signs of tagging, pinning, clipping, stapling, reverse printing on another form (paper) due to long contact and staining may lead to its genuine source.

Fig. 10.39
Modern con-art. Digital camera-computer mode! Exact duplication? Perhaps!

10.7.9 Transplanted Signatures

Money receipts were being signed in colonial days mostly on a revenue stamp pasted on the document. In fact, no payment over a certain amount was considered valid without a revenue stamp. The stamp carries major portion (body) of the signatures while the starting and ending letters or strokes may be on the main document. The forger sometimes lifts the signed revenue stamp and uses it to forge a document. The extraneous evidence rather than handwriting identification helps to establish the forgery.

1. The stamp carries additional adhesive and fibres from the surface from which it has been lifted.
2. The stamp is soiled, especially by additional (and different) gum.
3. The edges are frayed.
4. The beginning and the ending of the signatures are in different pen and ink.
5. The whole signature is sometimes re-inked. Ink used is often different.
6. The Ink, especially at the edges of the stamps, feathers due to fresh application of adhesive.
7. The stamp edges may carry abrupt endings of the writing strokes.
8. The revenue stamp on the fraudulent document may belong to a period different than that of the receipt.

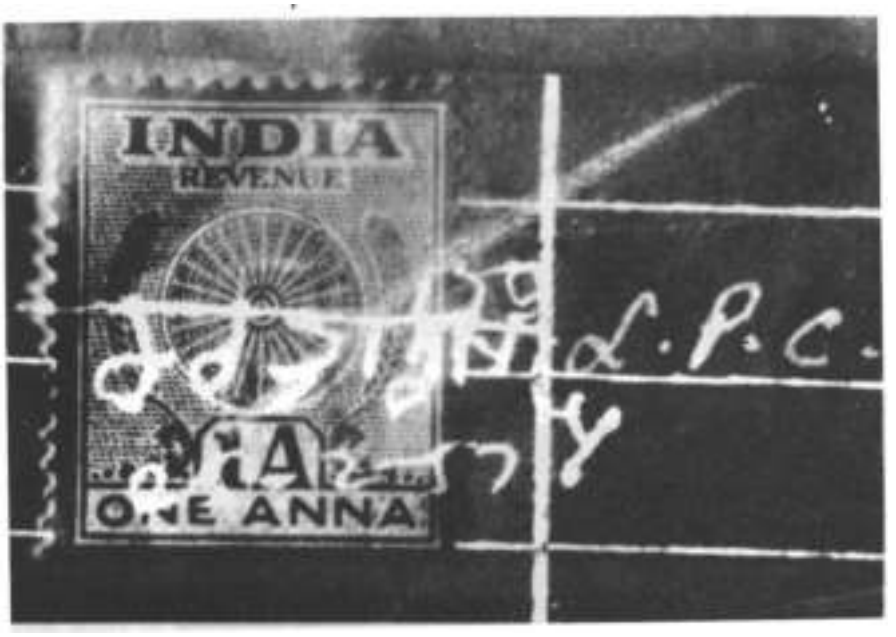


Fig. 10.40
Transplantation of signature on stamp is common but crude type of forgery. Here a used stamp bearing the signature had been lifted from a place and pasted. The leftover letters have been completed. The forgery of this type is easily detected if scrutinized properly

10.7.10 Genuine Writing Denied

A person may find it convenient to deny his genuine signature/writings on a document to avoid responsibility the document assigns. Ordinarily, it is not difficult to identify the genuine signatures if suitable standards for comparison are available.

Genuine signatures or writings have the following peculiarities in addition to those already mentioned:

1. The line quality of the signature/writing will be smooth, forceful and rhythmic. It will not look like a "drawing".
2. Genuine signature/writings will always have natural variations.
3. There is usual illegibility, pen failure, pen-lifts and the like.

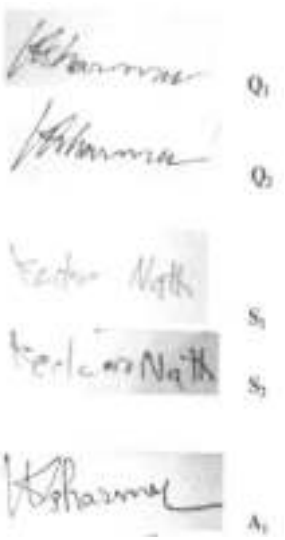


Fig. 10.41
A bank Loanee denied his signatures (Q1, Q2 and others). Distinguished his signatures (S1, S2 and others). Signatures ultimately identified from his signatures (A1) on a bail bond, signed before a prison officer.

10.7.11 Hand-Printing and Block-Lettering

The identification the authors of block letters and letter print writings offers no particular difficulty if sufficient amount of corresponding hand printed and block letter writing is available.

The specimen material should contain the same letters, words and figures written with similar writing instrument on similar writing surface.

10.7.12 Additions and Substitutions

The identification of the authorship of an addition, substitution or alteration in a document involving changes or modifications in a few letters, digits or a few words only is often not possible, though the fact that the document has been altered can be established in most of the case. The changes are identified from inks, spacing, differences in pens and erasures.

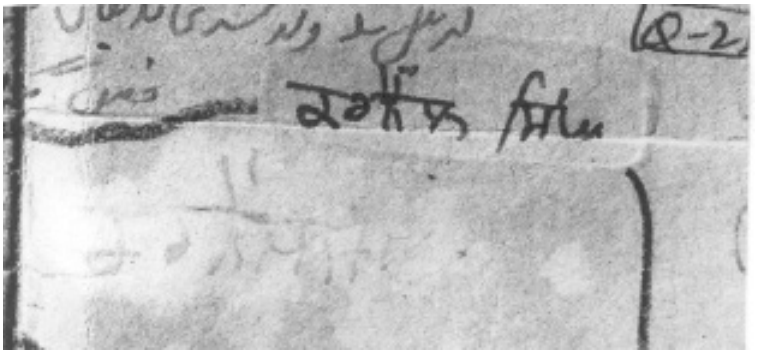


Fig. 10.42
Substituted signatures

If the changes contain extensive undisturbed (feathering, prior writing,) writing, it may be possible to identify the writer. The authorship of changes is identified from the handwriting characteristics.

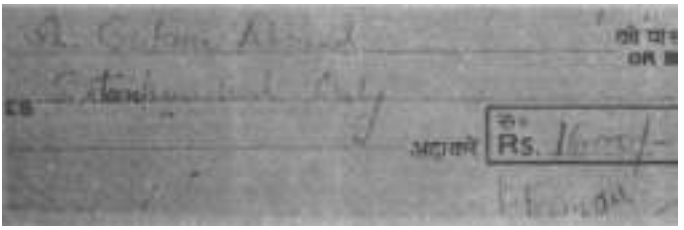


Fig. 10.43

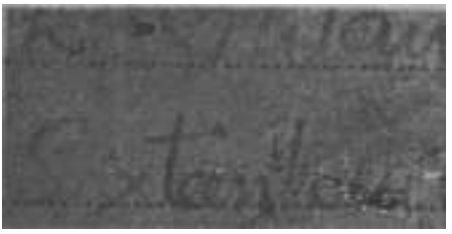


Fig. 10.44

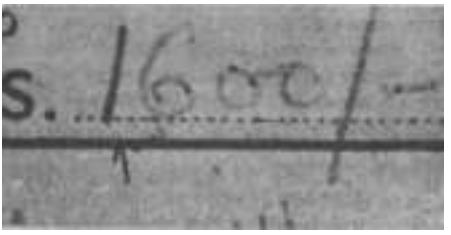


Fig. 10.45
Cheque raising is of frequent occurrence. In the present case 'six' hundred has been changed to 'sixteen' hundred. The original writing (top) does not look so suspicious but filter photography (middle) and ultraviolet rays (bottom) make the forgery so evident!

10.7.13 Anonymous Letters

An anonymous letter maybe for blackmail. If it is so, it must touch the victim at a sore point such as his sexual misbehaviour or dishonest dealings, the exposure of which is likely to cause him great distress. It also gives detailed instructions to the victim for handing over the price-money for non-disclosure. The blackmailer usually assures the victim that there would be no further demands.

An anonymous letter may carry a threat. Political, religious and industrial leaders and men in high positions often receive such letters. The letters focus attention on some of their unjust and undesirable acts.

An anonymous letter may contain hints to the identity of the person. These hints may be intended to implicate some persons who happen to be the enemies of the writer.

A writer may address an anonymous letter to himself, to attract the attention of the family or of the authorities. If it is a threat letter to a businessperson, his/her accounts are checked. The person may be trying to stage a burglary or fire to avoid legal payment or to collect insurance money.

An anonymous letter may be a recommendation letter. The writer is often a member of the family of the recommended person if he himself is not the writer. The inefficiency and negligence of others, in contrast to his good work, is sometimes discussed.

An anonymous letter may be for revenge. It contains disclosures about the character and illegal acts of a person. The allegations may be correct; or, they may be just the work of imagination.

An anonymous letter may be found at the scene of occurrence. It may be written by the culprit or the victim. It gives information about the crime, the culprit or the victim.

> *A few years ago, a letter was discovered in the underwear of a deceased person. It disclosed that he was expecting death at the hands of his wife and her new lover. The letter when discovered was partially washed and the writing had faded. The authorship, however, could be traced to the deceased through his authentic writing. (CH)*

An anonymous letter may contain abuses or indecent language. The writer thus gives vent to his pent-up feelings.

An anonymous letter may be a practical joke. Or, it may be the work of an unbalanced mind of a maniac.

Most of the anonymous letters are ignored.

10.7.13.1 Contents

The anonymous letters should get evaluated from a forensic psychologist. He can provide a lot of information about the writer:

1. The education level of the writer
2. The social status of the person
3. The sex, age and mental poise of the writer
4. The purpose and provocations for writing the letter
5. The nationality and occupation of the writer

In recent times, the building of writer's profile has come up in a big way. Police in USA have regular staff, psycholinguistics experts for profiling such writers. A psycho-logistic expert can provide a fairly useful and accurate portrait of the culprit in some cases.

10.7.13.2 Authorship

The writer of an anonymous letter is identified from the possible suspects through the study of:

1. Handwriting
2. Writing materials
3. Language
4. Fingerprints; the document may carry fingerprints of the writer.
5. Tracing materials; if some persons are suspected to write anonymous letters, they are identified through marked stationery and postal stamps. The source from where the suspect purchases these items are found and the items are secretly marked. When a fresh anonymous letter is received, the secret marks indicate the source of origin.

It is not, ordinarily, possible to disguise the handwriting characteristics in an anonymous letter because of its extended length, even though hand printing or block lettering. However, in cases of anonymous letters to political, religious and social leaders, it is often difficult to locate the possible suspects.

10.8 TYPE MATERIAL[17]

10.8.1 Identification

Identification of typescript with reference to a typewriter is comparatively an easy task. The degree of certainty in identifications is of the same order as in the case of fingerprints, tool-marks, or identification of fired cartridges and bullets in respect of a firearm.

Osborne[18] the great authority on questioned documents had rightly observed:

> *If a specimen of typewriting shows clear impressions and includes numerous characteristics and if suitable standards are available, it is possible to show with the highest degree of certainty that a document was or was not written on a particular typewriter.*
>
> 'Entirely new machines show slight but persistent divergences which can be seen upon close examination.
>
> Hilton[19], another great authority on questioned documents has observed:
>
> *Every typewriter is individual, as tolerances allowed in typewriters give variations, sufficient for individuality. The variations are increased by wear and tear.*

10.8.2 Principles

As in fingerprints, firearms and tool marks, no two typewriters give identical typescript, even when they are manufactured in the same factory, one after the other and are new. The manufacturing process of typewriter requires virtually hundreds of parts and hundreds of operations by hundreds of men scattered all over the world. It is impossible theoretically (also observed practically) to have two typewriters made exactly alike. Every machine has an individuality.

Even if a person (the best of mechanics) tries to make two machines exactly alike, he will not succeed. It has been tried and ended in failure.

The wear and tear, due to extensive use and abuse increases the variations in the typewriters:

1. The typefaces chip.
2. They get filled up and affect the clarity.
3. The bars, carrying fonts bend/twist and change the alignment of the letters and digits.

17. Typewriters are on the way out. However, typescript as questioned material is likely to continue for many years.
18. Albert S. Osborn, *Questioned Documents*, chapter XXXII, Second Edn, Reprint by Universal Publishers.
19. Ordway Hilton, *Scientific Examination of Questioned Documents*, 1982, Amazon.

4. There is gradual wear of the typefaces and other parts. The wear is useful in dating the typescript on a document.

Some variations in typescript of the same typewriter, at the same time and by the same typist do occur due to:

1. Difference in pressure with which the keys are pressed
2. Defective ribbon
3. Defective platen
4. Dirty type faces
5. Difference in typing rhythm due to different moods

Unless the typewriter is mishandled or misused, the typescript typed today is identifiable even after a long interval. The following typescript characteristics help to identify the typewriter:

Sizes of the letters; they vary from 6 to 16 letters per inch, though commonest size are 10 and 12 letters per inch, known as "pica" and the "elite" designs respectively. There are usually six single-spaced lines in an inch. These sizes are also expressed in metric system in some countries.

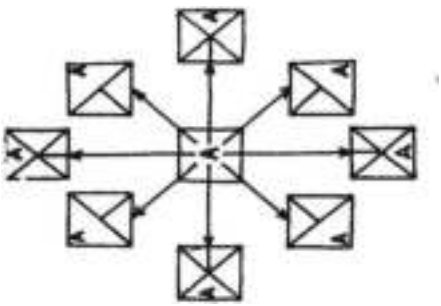
In addition, proportional spacing typewriters, in which different type letters occupy space according to their (letters') sizes are also in use.

The advent of computers, however, has made a typewriter an out-dated and an inefficient device, on its way out, but they are still extensively used in India. It will take some time before they become obsolete.

Design of the letters; the digits and punctuation signs vary with different makes and models. The notable differences are in letterforms, intra-proportions of the letters/digit, sizes, shapes, positions of punctuation marks, dots, bars, serifs, sizes and curvatures of the ovals of the letters and digits,

Imperfections in typescript; they are mainly due to alignment defects. They are individualistic in nature. Font Letters are seldom typed in the centre of the rectangles as intended. They are often off the feet, and twisted sideways, upward or downward. They contribute heavily towards alignment defects. They are also due to the faulty typing by the typist, but they are easily eliminated either by examining the typescript typed by different persons or by examining an extended text. The typing defects are not duplicated.

A letter can assume one of the major nine positions, or, any of the intermediate positions.



ALIGNMENT-DEFECTS

Fig. 10.46

A chart to indicate the alignment defects in typescript. The manufacturer of a typewriter wants the letter to be in the centre of the given space but due to imperfections in the manufacture, in the fitting, and due to use (wear and tear) it is seldom in the centre. It acquires any of the remaining eight positions (or intermediate positions). Other letters, digits and figures behave likewise. Thus the variations in typewriters due to alignment alone are infinite and no two typewriters, even fresh from the factory are exactly alike

Typeface defects; they are breaking, chipping, denting and twisting (introduced either at the manufacturing stage, during transit or due to use). They are very useful to individualise the typewriter.

> *In an important case, the machine was found damaged and no words could be typed. Impressions of the individual letters and digits, however, could be obtained. The questioned typescript was identified from the defects in the typefaces alone. (CH)*

Space variations; they are due to slippage, improper working of the ribbon gadget or irregular margin due to defect in the margin stop of a machine. They help to individualise a machine.

Temporary defects; they are defective ribbon, clogged typefaces and rusty and dirty bars. They introduce certain identifying features. They are useful only rarely, until the machine is not cleaned and serviced.

The advent of **Projectina Comparator** has facilitated the comparison of typescript. The comparator permits side-by-side comparison, superimposition or by placing the questioned and standard typescript one below the other. The computer also allows side-by-side comparison or comparison by superimposition.

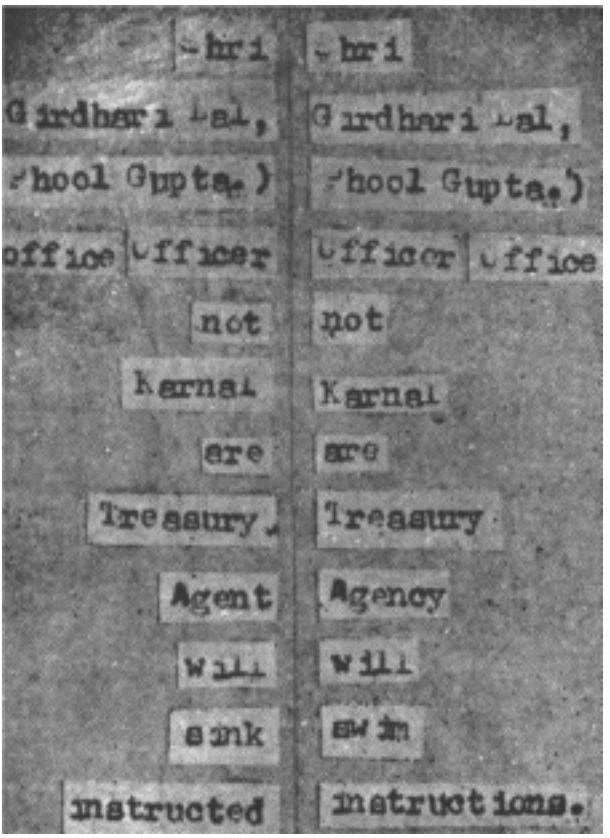


Fig. 10.47
A comparison chart of typescript of questioned and specimen texts, pasted side by side. They reveal a wealth of individual characteristics – wear and tear in letters (fonts) and alignment defects. The individuality of the typewriter is established like that of a fingerprint

10.8.3 Age of Typescript

The age of the typescript is determined from the progressive increase in the defects, consequent upon its continued use. If dated typescripts for an extended period, before and after, including the period in question are available, it is possible to ascertain the age of the document. The dated typescript of a typewriter is found in the office where the typewriter was used. The age of the questioned document is found from the dated documents, which have a similar set of defects, distinct from less or more defects, corresponding to earlier or later periods.

Sometimes a forged document is allegedly on a date on which the alleged typewriter in question was not even in existence. It is easy to detect such frauds. For example, typewriters in Indian languages except for Hindi typewriters were not in existence before 1950. If a document is allegedly typed before 1950 in an Indian language (except Hindi) it will evidently be a forgery, Hindi typewriter came into existence in 1910.

10.8.4 Typist

Identification of a typist is only a possibility with varying degree of probability. No prudent examiner can say that a particular typist typed the typescript. The following observations indicate the typist:

1. Peculiar alignment due to the characteristic shifting of the key
2. Punctuation, arrangement of paragraphs, margins, headings, use of capitals, choice of optional symbols, use of abbreviations, length of lines and method of writing figures, amounts and fractions.
3. Spellings and phraseology
4. The technique of correction, cancellation, interpolations and overwriting

Identification of the typist is based upon examination of extensive typed texts before the typing is linked/attributed to a particular typist.

10.8.5 Alterations

It is comparatively easy to detect alterations in typescript:

1. If the typewriter used for additions is different, the difference in typefaces permits identification.
2. If the same typewriter is used to induct addition, the alignment of fresh lines/text is different; because it is impossible to reinsert the paper, once taken out, in the same position on a typewriter. Misalignment, however minute, is detected and demonstrated by microscopic examination and magnified photographs.
3. If the additions are with changed ribbon (has been changed in between), the difference in the tint due to change in ribbon is noticeable and indicates the additions.
4. Spacing of words and lines also helps.

10.8.6 Suspected Additions: Check Points

Checkpoints for suspected additions to a document are:

1. Two forms of the same letter(s), in the text, indicate additions.
2. Alignments (both vertical and horizontal) of the added text/words differ.
3. Alignments of margins, of the added text, differ from that of the original text.

4. Use of different ribbon, for the questioned text (apparent from ink shades of the texts), indicates additions.
5. Different typing force (pressure), indicated by the extent of indentations, proclaims addition.
6. Varying ink deposits in questioned typescript points to fraudulent additions.
7. Different spacing pattern in the disputed text points to addition.
8. Paper sheets from different stock in multi-leaf document.
9. Writing sequence inconsistency in questioned text vis-à-vis original text indicates additions.

10.8.7 Make and Model

It is possible to know the make and model of a typewriter from its typed text. Some laboratories/institutes/departments keep extensive specimens of the typescripts from typewriters of different makes and models in their data bank. The data is used to fix the identity of the typewriter used (by comparing the data from the disputed text. However, in recent times many manufacturers of typewriters purchase font from the same manufacturer of fonts. The fonts, therefore, may not provide the necessary discrimination for the make and model. Further, the use of computers has made the data bank redundant.

10.8.8 Other Writing Machines

The discussions relating to typescript are equally applicable to similarly written materials by proportional spacing typewriters, electric or electronic typewriter cheque writers, adding machines and the like except that the modern electronic typewriter allows easy changes in the fonts and spaces.

10.9 COMPUTERS PRINTERS[20]

Fig. 10.48
A Multifunctional all-in-one computer printer

Computer-printer duo has emerged as the ideal writing machine for writing all sorts of documents in all fields. They are so convenient, fast, versatile and utilitarian that they are becoming indispensable. A significant advantage of the computer-printer is that the computer retains a copy of the document, which has been prepared on it and printed with it. If the person

20. For detailed discussion see chapter 19 of author's book: *Handwriting Forensics*, Publisher: LexisNexis, 2017 Edn.

who has prepared it denies its authorship or its existence, his denial is refuted by producing (with all the legal formalities) a copy from the computer printer. If the person has deleted the text of the document, the computer retains the image even after erasing. A computer expert can regenerate it.

The depredations of the fraudster misusing the computer-printer duo have brought in the Forensics expert to identify con artwork and to link them *inter se.*

10.9.1 Identification of printers

Computer printers and their identification vis-à-vis printed output have acquired tremendous importance in Document Forensics. The IO, the counsels and the courts have to deal with them increasingly. It is, therefore, necessary to be familiar with the computer-printer duo. The Forensics expert has to deal with them increasingly. He has to keep up with all the technologies concerned with the duo.

Researches for individualisation of the printer have gained momentum, as there is a growing need for the same. The problem is being tackled by studying the noise of the printer, manufacturing defects (accidentals) and the wear and tear of the various parts of the printer. In addition, the printer identifications include the following explorations.

10.9.2 Intrinsic Signature

Intrinsic signatures are the unique features of a printer of a particular make or model, which are transferred to the printed documents. They are printed with laser or jet printers.

The identification of the printers is based on banding signals to discriminate the machine.

10.9.2.1 Inconspicuous Tiny Yellow Dots Patterns

Most of the laser printers print yellow dot patterns. The process is called steganography. The pattern indicates the make and model of the printer and metadata[21] about the printing. The absence of these yellow patterns generally indicates that the document has not been printed with a laser printer.

Induction of yellow dot patterns is a highly desirable step, forensically, to identify a printer positively and irrefutably. The metadata thereon is also useful to fix the history of the document. The induction, therefore, should be enforced through legislation, if necessary. All printers should print the identifying information mentioned above, on all their printouts to help Forensic investigation when required.

10.9.2.2 Hue Histogram

HSV (**H**ue **S**aturation **V**alue) colour space, based on hue histogram, for identification of printing process (ink jet, laser jet or photocopying) is likely to gain grounds in colour printing. The features selected for discrimination are:

- Hue contrast
- Periodicity, and
- Overspray

21. Meta data is data that provides information.

10.9.2.3 Colour Discrimination

A novel new technique is currently being explored. It is to capture the text images at high resolution with a high-power camera, usually of a single character. The image is transferred to computer. Unique colour count, texture feature uniformity and intensity variations features are used for comparison and discrimination with similarly generated data from the suspected printer.

The methodology is applicable to link the printouts from inkjet and laser printers with the originating machine. Identification and linking fake documents to scanners, colour LaserJet printers or colour inkjet printers is possible in most cases.

10.9.2.4 Other Techniques

A lot of research is going on to find ways and means to link the printer and the printed material via the study of the Gray level features for discriminating ink jet print from laser jet print, The methods are based on high resolution scanned images, e.g., 3200 dot per inch.

Research on evaluation of other gray level features like perimeter-based edge roughness of the text for print technique classification system, is going on.

10.10 INKS

Inks are complex mixtures of solvents, dyes, pigments, particulate matter (carbon in India ink) solubilisers, stabilisers, fluorescent materials, resins, lubricants, surfactants, made into a liquid for manual writing and into a paste for printing purposes, to produce images, texts and designs. The nature/quality/quantity of the ink ingredients determine the characteristic of its output (writing) along with other factors; for example, the format.

Computer printers and photocopying machines also use powder inks.

The examination of ink is one of the most difficult and yet important tasks in the examination of documents. The variety of inks is very large. The amount of ink available for examination is extremely small. An ounce (28.35 g) of dry ink gives six miles un-blotted ink line. The examiner has to content him with about one millimetre of the ink line, which may be blotted. The analysis of ink is, therefore, undertaken, only when it is vital.

10.10.1 Nature

The following types of inks are common:

10.10.1.1 India Ink

It is carbon suspension in water. The ink is made stable by the addition of glue. The colour is improved sometimes by the addition of Prussian blue. The ink was commonly used in India in schools with reed pens and by the petition writers in writing important documents. The use of ink has decreased tremendously in the recent past. The ink has become obsolete, for all practical purposes.

The ink is highly stable and is not affected by chemical reagents. It is neutral and does not damage the paper. It does not penetrate into the paper. It can be removed by scraping or by wetting and blotting.

The black colour may have different shades: black, brownish or yellowish black. They permit differentiation and identification of the inks.

10.10.1.2 Iron Gal-Tannate Ink

A mixture of tannic acid and gallic acid extracted from wood when mixed with ferrous (iron) salts, gives a colourless liquid which on drying and ageing gives black colour. The ink as such is not suitable. It is mixed with dyestuff to give proper shade. Some acid and phenol are added to give stability. The common blue-black ink belongs to this class. It is permanent ink. It changes colour in course of time from blue-black to black (due to change of iron from ferrous to ferric state). Its stains on the clothes are not washed off easily. It was being used for writing important documents throughout the world. Its use is also decreasing. It may also vanish from the scene in the coming years.

10.10.1.3 Dyestuff Inks

The most popular inks these days are dyestuff inks manufactured from a number of dyes, particularly from nigrosine dyes. They are available in all colours and shades. They are washable and are not permanent inks. They fade with time. The fading period depends upon the individual dye.

10.10.1.4 Ball Pen Inks

Ball pens have become very popular because of their convenience in use. Ball pen inks are dyestuffs suspended in a suitable vehicle. Vegetable oils were used as vehicle for the dyes formerly. Glycols are replacing vegetable oils as vehicle in the inks.

Ball pen, using ordinary pen ink, has also come up. It uses a sapphire tip (ball) contained in a platinum housing.

A suspension of carbon (graphite) in a fluid gives liquid lead pencils. They are like ball pens.

10.10.1.5 Logwood Inks

Logwood extract with potassium dichromate gives permanent ink. It is not used in our country to any appreciable extent.

10.10.1.6 Alkaline Inks

Alkaline inks are manufactured from dyestuffs and copper or vanadium complexes. They are quick drying and are permanent inks.

10.10.1.7 Special Inks

1. **Printer's ink***:* It contains carbon, adhesive and drying oil.
2. **Cancellation ink:** It is used in post offices. It is similar to printer's ink.
3. **Stamp-pad ink:** It contains dyestuffs, glucose and glycerol or glycol.
4. **Typewriter ink**. It contains dyestuff and oil (castor oil). It may contain carbon for permanency.

10.10.1.8 Carbon Nano-tube Ink

A new carbon ink has come up recently. It is a suspension of carbon nanotubes in a polymer. These inks are used in inkjet printers**.**

10.10.2 Pencils

The following are the various types of pencils or pencil like entities:

1. **Lead pencils*;*** normally contain graphite, clay and glue. The extruded 'lead' is glued in wood.
2. **Copy Pencils*;*** *i*n addition to graphite and clay, copying pencils contain dyestuffs. They are called copying pencils because a copy from a dense copy pencil writing can be prepared. They are also known as indelible pencils because it is not easy to remove copying pencil writing—the dye spreads all over the surface.

   The compositions of lead and copying pencils vary, which permit discriminations.
3. **Coloured pencils*;*** *c*oloured pencils are crayons. They contain dyestuffs dissolved in waxes.
4. **Coloured chalks**; coloured chalks are sticks of calcium sulphate mixed with dyestuff.

10.10.3 Examination

Examination of inks is carried out to find out suspected additions, obliterations, erasures, the age of the writing, or to restore faded writings. The examination involves:

10.10.3.1 Visual Examination

The colour and shade variations are carefully noted with angle-poise table lamp and spotlight. The observations are made with light falling at various angles and in transmitted light. The examination reveals apparent, variations, discrepancies and erasures.

10.10.3.2 Magnifiers

Magnifiers facilitate the examination of inks. The stereomicroscope is especially useful. Some manufacturers provide arrangements for transmitted light and a tilting stage. The two accessories are invaluable in the examination of questioned documents.

10.10.3.3 Filters

Filters of different colours are helpful in the detection of differences in ink shades and evaluation of faded writings or writings obscured by obliteration or by highly coloured surfaces. A modern computer has excellent provisions to study the inks under varying magnifications, contrast, brightness and colour shades provided the original writing is properly transferred to the computer digitally.

10.10.3.4 Invisible Rays

Soft X-rays, ultraviolet rays and infrared rays are useful to study the variations in inks. A Video Spectral Comparator (VSC) is useful to carry out these studies. A poly-light instrument permits evaluation of ink under radiations of varying wavelength including ultraviolet and infrared rays.

Fig. 10.49
Infrared photography reveals the place of posting of an anonymous or pseudonymous letters. In the present case figure (above) is an infrared photograph of the postal stamp 'park street' Both in english and Hindi is revealed clearly

10.10.3.5 Spectrographic Analysis

If metals are suspected in an ink, spectrography, especially with laser microprobe, of a small amount of ink writing, proves useful to give their nature and quantity.

10.10.3.6 Chemical Tests

The inks may be acidic, alkaline or neutral. They may be attacked or may resist the attack of oxidising or reducing agents. The action and time of reaction is noted. The chemicals used for the tests are: chlorine or bromine water and stannous chloride, potassium permanganate and sodium hydroxide solutions. They differentiate the inks. Many other chemical reagents have been used in the past and are being used by some experts, but they are useless in the context of modern development of other refined methods.

10.10.3.7 Chromatographic Analysis

Thin Layer Chromatography (TLC), is the most important and technique useful in distinguishing different types of inks via the dyestuffs added to them. The technique separates the dyestuff constituents into the band. The separated picture is called a chromatogram. It has proved handy, as it is quick, cost and time effective, sensitive and specific for most of the inks. There is no streaking. In short, TLC is the most frequently used technique to differentiate and identify inks.

10.10.3.8 Electrophoresis

The inks are subjected to electrical field. The dyestuff constituents separate out in bands due to differences in their nobilities. The results are similar to those obtained in TLC but the process is cumbersome and time consuming. It is not used frequently.

10.10.3.9 Spectrophotometry

The dyestuffs can also be identified by spectrophotometry and their chemical nature determined after separation through chromatography.

10.10.3.10 Video Spectral Comparator (VSC)

Video Spectral Comparator is an instrument of choice, which helps in the identification, and comparison of inks. The writing understudy is exposed to various wavelength of the spectrum (usually UV visible and infrared rays). The effect of these rays on the inks is displayed on a monitor (TV screen). The system has also proved useful for faded or obliterated writings.

10.10.4 Age of Ink

The determination of the age of ink is not an easy task. The following observations are helpful:

10.10.4.1 Colour Changes

Only the blue-black ink changes its colour from blue-black to black. The change is gradual and is affected by factors like quality of paper, storage conditions, exposure to sunlight, air, humidity, exposure to ageing agents,

10.10.4.2 Smudging[22]

Fresh ink writing is easily smudged, while old ink writings do not smudge.

The smudging is due to wiping/rubbing or dissolution of ink dyestuff in solvent (water). The dyestuff becomes insoluble or fades away with time. Or, it is masked by the iron tannate formed. Therefore, the time taken for the solution of the ink in a solvent and smudging are important indicators of the age of ink.

10.10.4.3 Diffusion Pictures

Inks often contain sulphate or chloride ions from the acids added to them. They diffuse into the paper with the passage of time. If the paper is treated with lead acetate or silver nitrate, sulphate or chloride ions precipitate as lead sulphate and silver chloride to give diffusion pictures. The age of the writing is directly related to the extent of diffusion, indicated by the diffusion pictures. However, diffusion is affected by many undeterminable factors, which make estimation of age a mere guess work because the analyst does not know the upkeep of the document.

10.10.4.4 Ink Age Markers

In view of the importance of determining the age of documents manufacturers of ink in certain countries adds age markers – chemicals – to the ink. The added chemical changes progressively with the passage of time. The extent of change indicates the period and hence the age of the document.

Ink age markers are usually radioactive substances.

Ink age markers have not been used in India, so far.

22. Make or become blurred/smeared.

10.10.4.5 Faded Writings

The restoration of faded writings is possible where the ink used contains iron or other metal. The iron-tannin ink is the commonest ink amenable to restoration. The writing is restored by:

1. **Exposure to ultraviolet rays**; it reveals the writing in many cases, the faded writings is exposed to moist hydrogen sulphide/ammonium sulphide. Writing appears in black colour.
2. **Contrast photography**; it reveals the writing. It may need the use of filters *(e.g.*, yellow filter)
3. **IR Photography**; it reveals writing in ink or pencil containing carbon may;
4. **Electrostatic Detection Apparatus (ESDA);** the image developed may reveal writing in some cases.
5. **Iodine fuming**; it may help in some cases. The image developed is photographed.

Dyestuff inks, ordinarily, do not leave residues. Therefore, they are not amenable to the restoration of the writing.

Computers by using magnification, colour contrast and colour changes,, has proved useful in many cases to figure out the faded writings.

10.11 PAPER

10.11.1 Nature

Paper essentially consists of cellulose obtained from wood, straw or rags. The material is beaten to small shreds, decolourised and their suspension in water is passed over a continuous moving wire gauze screen. Water is sieved through the screen and the shreds get interlocked with one another due to constant shaking of the carrier screen. By the time the paper material reaches the end of the screen, it is drained off most of its water content and acquires sufficient strength for further processing. A watermark is given to the paper at this stage where the impression in relief is pressed on to the paper with a dandy roll bearing the mark creating die.

The paper thus obtained, is like a blotting paper, unfit for writing purposes. Therefore, to make it fit for writing, the paper is sized with a loading material, like kaolin (china clay)/ calcium or barium sulphate, added to the suspension of the shreds. The surface of the paper is still rough. It is, therefore, glazed with a mixture of rosin and alum. Starch, gelatin, latex, wax and plastic resins are also used. Finally, the paper is passed through hot rollers. They dry the paper, smoothen its surface and give gloss to the surface. The process is called calendaring.

Research in the paper industry has brought certain improvements. For example, wet strength of the paper is increased by wax or resin treatment. Paper has been prepared from synthetic fibres like nylon (for enhanced strength) and special surface treatment has given NCR (no carbon-paper required) paper. This paper does not require ribbon or carbon paper to prepare typescript documents. Security paper carries special surface treatment. High denomination bank notes carry a security thread, firmly interlocked in the fibres of the paper and watermarks.

10.11.2 Examination

The examination and comparison of paper involve the appraisal of the following entities:

1. Dimensions: length, breadth and thickness
2. Weight per unit area

3. Colour
4. Fluorescence
5. Loading and sizing materials: checked chemically/spectrographically
6. The nature of the fibre: studied by chemical/microscopic/staining techniques.
7. Water marks: studied and compare using UV rays/transmitted light.
8. Wire-gauze marks.
9. Opacity, stains and erasures
10. Ruled lines on the paper
11. Artificial ageing
12. Ash

The detailed discussion of the methods is beyond the scope of the present work.

10.12 ERASURES

Disputed documents often carry erasures. They are used to remove some unwanted date/word/figure/letter/digit.

10.12.1 Techniques

The erasing techniques used are:

10.12.1.1 Mechanical erasures

The area bearing unwanted writing is scraped/rubbed to remove the writing. The tools used for erasures are usually razor/penknife/sharp blade/eraser or even a fine sand paper.

The process disturbs the surface. The extent of damage to the paper surface depends upon the nature of the ink, writing surface, the technique employed for the removal of the writing and the skill of the con artist.

10.12.1.2 Solvent action

Certain inks are readily soluble in solvents like water, alcohol, acetone, petrol, chlorohydrocarbons and tetrahydrofuran. The sites are swabbed repeatedly with a tested suitable solvent. The solvent dissolves the ink and the swab removes it.

10.12.1.3 Chemical action

Oxidizing and reducing agents like potassium permanganate solution, chlorine or bromine water and sulphurous acid decolourise the writings. They are extensively used.

10.12.1.4 Detergent action

Certain inks especially carbon inks are easily removed by detergents. They detach the inks from the surface and the swab remove it.

10.12.1.5 Trimming

Certain unwanted entries are trimmed off. It is possible only if the unwanted writing is on one side or on a corner of the document. Sometimes trimming has been done even in the middle of the paper.

In an interesting case a person died, leaving his considerable immovable property to his two daughters. His brothers thought that family property should not go to the daughters. They forged a Will from father side, in which he gave all the property to these brothers. The signatures of the testator were available in some other document. They trimmed off the blank part of the document and pieced the signature bearing part to the last page of the typed Will with the help of a tape after cutting off the blank portion of the last leaf. The process was clumsy. The following glaring acts of omission and commission declared the forgery:

1. *The length of the pieced paper was less vis-à-vis the other two leaves of the Will.*
2. *In the process of piecing the ink of the signature got smudged. They re-inked the signature with a different pen and ink. The re-inking process was easily visible.*
3. *The handiwork was highly unsatisfactory. They forged another signature of the simulated testator which again was done so carelessly that it itself proclaimed forgery! No expert evidence was needed to proclaim forgery.*

The forgers, however, have taken care to use the same paper for three-leaf document, except the signature bearing piece. (CH)

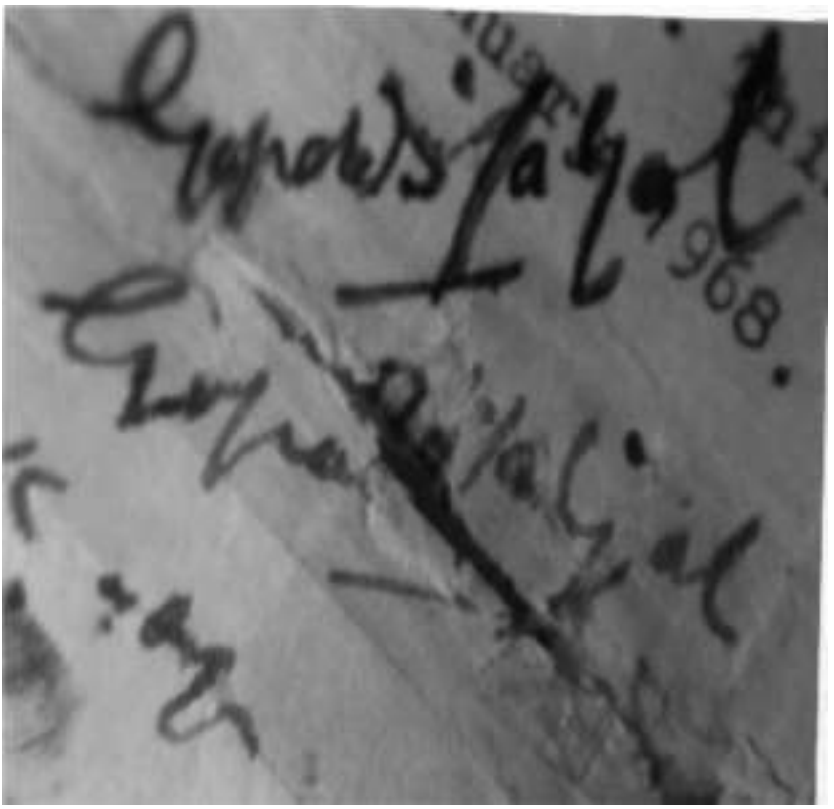


Fig. 10.50

A crudely forged will, in which the testator's signature bearing paper piece was taped to the last trimmed page of the text. In the patching process the signatures were disturbed. Another signature was forged. the second signature had to be inked, as initially ball pen was used which was not prelevant on the alleged date of will. The stereomicroscope revealed the patch work as well as the over-inked signatures

10.12.2 Detection

Both physical and chemical methods are used to detect erasures and to read or restore the original writing. The usual drill is to check:

10.12.2.1 Dimensions

Length, breadth and thickness of the given document are checked on all sides. The document is further checked for repairs.

10.12.2.2 Lighting

The expert examines the document for erasures with ordinary light at various angles. Grazing light and transmitted light are particularly useful. They reveal mechanical erasures in most of the cases.

Angle-poise lamp and spotlight lamp are useful for the examination.

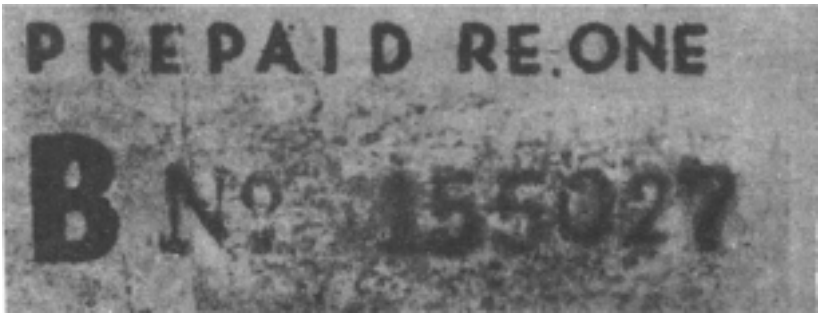


Fig. 10.51
Tampering of the lottery ticket is revealed by the disturbed fibres

A VSC or a poly lite system of light provides not only visible light but also ultraviolet and infrared radiation also. They are being used increasingly for the evaluation of documents. UV rays reveal chemical erasures.

10.12.2.3 Stereoscopy

Stereomicroscope is an indispensable instrument in the examination of questioned documents. A document expert usually uses a zoom type of stereomicroscope with a tilting stage and arrangement for oblique/transmitted lighting. It helps to:

1. Detect erasures
2. Ink hade difference
3. Additions
4. Alteration of digits/figures/words
5. Detect line quality defects in simulated/traced forgeries
6. It permits discrimination of electronically transferred or handwritten signature
7. It is the first instrument used for the preliminary examination of documents.

8. Find out the erased original writing.
9. Find out the text from the reverse writing impression on the reverse page of the document especially if the document was written with a dirty paper support. The writing on the surface is inverted It is read with the help of a mirror/photograph.
10. Figure out indented writings on the document.

10.12.2.4 Ultraviolet (UV) Rays

UV rays' source is a constant companion of Document Examiner. They give different fluorescence with different materials Thus; they permit detection of physical/chemical/solvent erasures through the difference in fluorescence at the erased and un-erased surfaces. Fluorescence may also reveal the original text especially in chemical erasures. Ultraviolet rays also detect additions/obliterations/alterations,

10.12.2.5 Photography

Photography using oblique/transmitted lights frequently reveals the sites of erasures and sometimes the original writings. Photography with ultraviolet rays often reveals the original text especially in chemical erasures. Photography with infrared rays is useful in those documents in which infrared opaque inks have been used. Some permanent inks are opaque to infrared rays. The rays reveal the site of erasure and allow evaluation of the original writing.

10.12.2.6 Solvents

Erased writings, written with indelible pencil, are often restored by alcohol vapours which intensify the colour of the ink. The document is placed in a closed chamber containing alcohol in a dish. The alcohol vapours are allowed to develop the writing.

10.12.2.7 Chemical Action

Hydrogen sulphide, ammonium sulphide, and hydrogen sulphocyanide on coming in contact with a moist iron salt of the ink gives black or red colour. The erased writings, which were written with inks containing iron are often restored by the action of these reagents.

Tannic acid and other organic reagents which give coloured compounds with iron are also used to restore the faded writing.

10.13 SECRET WRITINGS

Criminals, (whether inside or outside the jail), criminal gangs, political offenders members of secret societies/subversive groups and international spies frequently interact with their partners, relatives, sympathizers, or friends on illegal matters through secret writings.

The detection techniques of secret writing vary with the methods and material used for the writings.

They can be very simple or highly complex. Some examples are:

10.13.1 Invisible Inks

Invisible inks are also known as sympathetic inks. The nature of the inks varies tremendously. The criminals who have limited resources at their disposal, especially inside a jail, have used simple substances like water, body secretions (saliva, urine, and perspiration), tea, milk, sugar,

fruit juice, soap, toothpaste, medicine, perfume and the like. On the other hand, the invisible inks may be highly complex chemicals. The writings are often decipherable with ultraviolet rays, infrared rays, soft X-rays. Colour reactions with specific reagents are also used. The ink may be heat or light sensitive, or, it may have a radioactive substance and its presence in specific words forms the text of secret writing. The rest of the writing, thus, forms cover for the message.

Invisible writings on documents are processed in a laboratory. Most of the secret writings allow identification and evaluation of the writings because the surface of the paper carrying the writing is disturbed at the place of writing and the extraneous matter is deposited therein. The disturbed surface and the extraneous matter make it possible to find out the writing. The following process is adopted:

1. The document is examined with ordinary light falling at various angles. Grazing light and transmitted light are often useful.
2. The above observations are repeated using a stereomicroscope. Sometimes, in addition to the detection of the presence of the secret writing, the contents (message) is deciphered.
3. A large number of "inks" fluoresce in ultraviolet rays. The secret message may thus be revealed. The differential absorption and reflection of ultraviolet rays may also help to decipher the secret message.
4. If the secret ink contains some heavy metal, opaque to infrared rays, the writing, is revealed in an infrared photograph.
5. X-rays opaque metal salts become visible with soft X-rays either in a radiograph or on an X-ray screen.
6. If radio-active substances have been used to tag certain words in a text, they are located Geiger counter.
7. Iodine fuming reveals secret writing in many cases. It also does not disturb or spoil the document extensively. Differential absorption of iodine fumes at the place of writing reveals the text.
8. Writing with a silver nitrate solution becomes evident when exposed to strong light.
9. Writings with body fluids or fruit juices become evident when the document is heated. Heat also affects certain salts and organic compounds. The document is heated with an electric iron or in an electric oven.
10. Coloured powders and solutions are employed only when other methods fail because coloured powders and solutions disfigure the document and may spoil other writings. They are used only when the document is not important, and it is not to be sent to its destination. However, the document is photocopied before it is treated with coloured powder/solutions.
11. Chemical methods depend upon the correct identification of the sympathetic ink. Reagents are then employed which give coloured compounds with the inks.

The chemical reagent is used only after testing that it will be useful and would not damage the document.

10.13.2 Miniature Writings

The secret message may be in a microphotograph. Even a photograph of the size and shape of an inconspicuous dot may carry all the necessary information of a secret message. They are evaluated through a microscope or enlarged photographs.

10.13.3 Latent Photographs

A secret message may be conveyed through an exposed but undeveloped film/bromide paper. The recipient develops and fixes it to read the message. If it falls into wrong hands, the message is destroyed as soon as it is exposed to light.

If a police officer comes across a packet containing some material wrapped in black, red or brown paper, he should open the same in a dark room only. If a piece of sensitive photographic film or paper is found, it should be developed immediately.

If it is essential to send the message to its destination, a similar latent is prepared and sent.

10.13.4 Codes and Ciphers

To convey secret messages, codes and ciphers are extensively used. The secret services, military, police and other administrative departments are frequent users.

Governments employ highly complex codes and ciphers while most of the criminals use simple codes. Computers have made use of highly intricate/complex codes/ciphers easy. If sufficient coded material is available, it is usually possible to decode the same by the code experts.

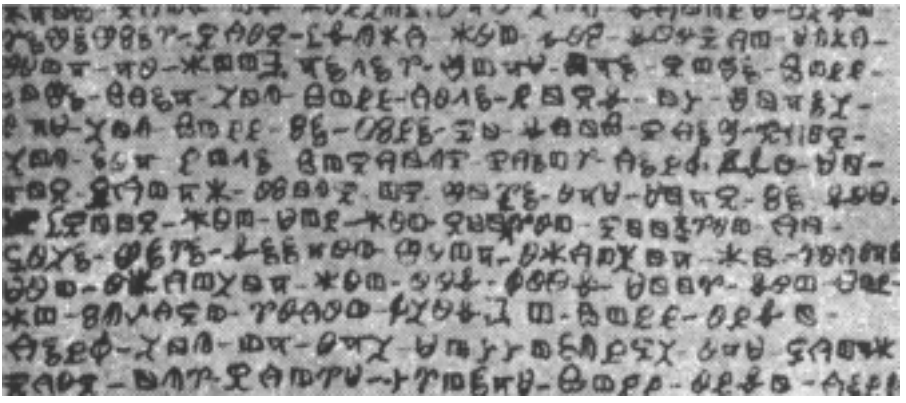


Fig. 10.52
Photograph of a letter in code. The cyphers were simple and the contents could be evaluated

10.14 BURNT DOCUMENTS

Processing of burnt documents involves the following techniques:

1. **Visual examination,** it may reveal some writing. It is photographed.
2. If the original writing was in carbon/other infrared opaque ink and the document is not fully burnt, an infrared photograph may reveal the writing.
3. A charred document, placed in contact with a photographic film/plate, affects the emulsion differentially, to reveal the writing in some cases.
4. Sometimes, silver nitrate solution helps to read the charred writing. The document is placed over a glass plate in a photographic enamelled tray. A second glass plate

is placed over it in such a way that it does not touch the document. Silver nitrate solution is poured in the tray to cover the charred document. The writing appears grey against black background.

10.15 AGE OF DOCUMENTS

10.15.1 Age Indicators

Age of a document sometimes assumes importance. It is indicated by the following observations:

1. The age of paper can be a rough index of the age of the document. The document cannot be older than the paper itself. Some paper manufacturers keep a record of the watermarks and put some signs, which indicate the year of manufacture. The reference to the manufacturer, therefore, can get the age of the paper.

   The watermarks, the composition of the fibre, sizing and loading materials used are useful indicators.

   The British archives purchased Mussolini's diaries they were referred to historians. They opined that the facts given in the diaries were correct. But there was nothing in the diaries which was not already known about Mussolini. It created a suspicion that the diaries might be forgeries. They were sent to a document expert. He found that the paper on which the diaries were written contained optical brightener, which was unknown in Mussolini's days. He, therefore, opined that the diaries were fake. (CH)

   The condition of the paper gives its approximate age.
2. The age of ink gives the age of the writing/document.
3. The use of a particular pen points to the age of the document in some rare cases. For example, in India, ball pens were not used before 1950. Therefore, a document, written with a ball pen, prior to 1950, is unlikely to be a genuine document.
4. The revenue stamps carry distinct marks indicative of the period of their printing. A revenue stamp can, therefore, indicate the age of the document. The security press at Nasik can give the age of the document.
5. An office changes its seals from time to time, as they become defective with the passage of time or become out-dated. The comparison of the questioned seal impression with the standard impressions of seals and stamps with dates (available on office files) may give idea about the age of the document bearing a seal mark.
6. The contents of a document may contain references to events, which happened after the alleged date of the writing of the document. Such a document is evidently a forgery.
7. The alleged writer or signatories of a document may not be in existence or present at the alleged station on the material date.
8. The age of a typewritten document may be indicated by the age of the typescript.

10.15.2 Artificial Aging

The document is sometimes artificially aged. The following techniques are employed:

1. The document is placed in a chimney. The smoke of the hearth 'ages' the document.
2. The document is soiled with dust or dirt.
3. Heating or exposing the document to sun or ultraviolet rays 'ages' the document.

4. Iodine fuming or treatment with other chemicals *(e.g.,* sulphur dioxide, permanganate solution) 'ages' the document.
5. An old paper, from some old books, is used to forge the document. The ink on the document indicates the forgery.

It is possible to detect the artificial ageing of a document in a laboratory, in most of the cases.

10.16 OBLITERATIONS

Obliteration is covering the unwanted/offensive writing with a thick dark ink/paint/fluid, to prevent deciphering the contents of the writing. Some con artists obscure the writing after scoring it extensively so that the resuscitation of the writing may not be possible. The following techniques are used to read the obliterated writings:

1. Examination under strong light at various angles particularly with transmitted light frequently reveals the obliterated writings when the ink used for obliteration is not too dark or too thick.
2. If infrared rays can pass through the obscuring ink but do not pass through the ink in which the document is written, an infrared photograph reveals the writing.
3. Solvents like acetone or tetrahydrofuran may remove the obliterating ink.
4. Ink eradicators remove the obscuring ink.
5. High contrast films on contact printing may prove useful and reveal the writings.
6. Colour filters reveal the writing if the shades of the obscuring and the original inks are different.

If the text has been obliterated soon after the writing using the same pen and ink, it is often difficult to read the original text.

Scoring and abrading the writing surface, prior to obliteration, make the task more difficult.

In a recent case, a letter suspected to carry an important address was received. The original address was badly scored and erased. It was then covered with the same type of ink. The obliteration was completed by pasting a piece of paper over the address with a strong adhesive.

Thorough processing gave only partial success. (CH)

Fig. 10.53

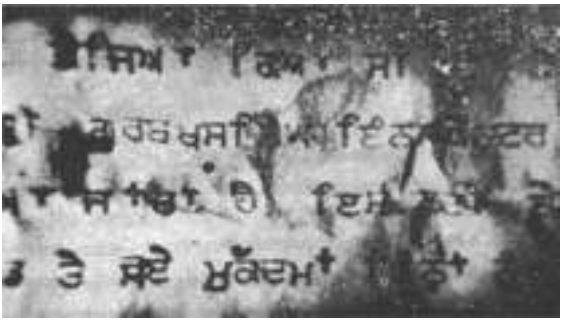


Fig. 10.54
Infrared rays also reveal obliterated writings. Fig. 10.53 is a photograph with ordinary light. Fig. 10.54 is a photograph with infrared rays

10.17 SEQUENCE OF STROKES

The study of sequence of strokes helps to find out if some fraudulent additions have been made to the existing text.

The crossed strokes of the alleged original and additional writing are studied to find out the order of the strokes. It is a difficult study. Inexperienced persons make mistake frequently.

The following points usually help to determine the sequence:

1. The ink from a line of new writing spread over the previously written line where the new line crosses the older line in some cases in some cases. If ink has spread, the order of strokes is established. A stereomicroscope is useful to study the spreading.
2. The pen some time creates a furrow in its written line. If it the upper line it will show continuity of the furrow. If it is the line from the prior writings, it shows discontinuity of the furrow at the crossing point.
3. A pen may deposit ink on side(s) of writing line. If the deposit line is continuous, it is written later. If its continuity is broken at the crossing point, the line was written first.
4. The fibre along the writing lines is conspicuously disturbed if the pen nibs are defective. The disturbance of the fibre may indicate the sequence of strokes.
5. An Electrostatic Detection Apparatus (ESDA), usually utilised to decipher indented writing, also helps to decide which stroke was written first. The image obtained indicatescontinuity/discontinuity of the intersecting lines.
6. The Scanning Electron Microscope (SEM), also helps to find the sequence of stroke. The instrument is costly and not available with most of the laboratories in India.

The sequence of strokes in pencil lines is indicated by the continuity/discontinuity of furrow in the writing lines.

The novice is trapped in ink shade deceptive illusion. Ordinarily, the line in darker shade appears to be on top even when it is the lower line, written first. Only an experienced examiner can establish the correct sequence of strokes.

10.18 INDENTED WRITINGS

10.18.1 Indented Writing

Indented writing is the impression from the writing instrument (pen/pencil,) on a sheet(s) of paper underneath the paper being written upon. Such indented writings are often found on letters, pads, notebooks in educational institution, record registers in offices,

Indentations of the original text on the erased writing are sometimes met with. They are also useful to reconstruct the original writings.

In criminal situations, indented writings appear on disputed documents, anonymous or pseudonymous letters, threat letters, ransom notes, Sometimes, they assume great importance.

10.18.2 Processing Indented Writings

The following techniques are used to detect/read indented writings:

1. Ordinary light (from an angle-poise/spotlight lamp) is allowed to fall at grazing angles, less than 30°. The light intensity is gradually decreased. The observations are repeated with a stereomicroscope. The examinations reveal the indented writings frequently.
2. When the indented writing is fumed with iodine, the quantity of iodine deposited is less at the place of the indented writing than at the rest of the paper surface. The contrast allows the evaluation of the text.
3. A solution containing iodine, potassium iodide and glycerine in water is spread over the surface bearing the indented writing. It frequently reveals the writing.
4. A photograph taken on a contrast film using grazing light often reveals the writing.
5. ESDA (Electrostatic Detection Apparatus) is an important machine. It reveals the indented writing in most of the cases. In some cases where other methods, have failed, it has succeeded.

   The apparatus and its functioning are simple. The document is sandwiched between a thin transparent plastic film and a porous copper plate. High voltage is applied to the system and toner is cascaded over the film. The toner gets concentrated on the indented line of the writing and makes it readable.
6. Scanning Electron Microscope (SEM) gives 3-dimensional images. It has therefore, the potential to reveal indented writings.

Fingerprint powders/coloured solutions may reveal the indented writings, but they spoil the documents. They are not used to reveal the indented writings usually.

Fig. 10.55
Indented writing revealed by powdering an innocent looking paper

10.19 CLOSED ENVELOPES

The following process helps to know whether a packet (letter) has been opened or not:

1. The packet is examined under strong light, especially with transmitted light, using a magnifying glass. Additional gum, tearing and accumulation of paper fibres at certain places indicate opening of the packet.

Examination with a stereomicroscope improves observation power.

2. Ultraviolet rays differentiate the additional gum put on the packet.
3. If a seal impression *(e.g.,* postal cancellation stamp) or some writings (even lines across the flap) have originally crossed the opened flap; in reclosing, some misalignment is bound to occur.
4. Chromatography (TLC) differentiates old and new gums or adhesives.
5. If a sealed packet is opened and resealed, the new wax used for resealing and the defects in the new seal mark would indicate opening of the packet.

10.20 WRITING INSTRUMENT

Positive identification of the writing instrument (pen)y is rather difficult. Only in rare cases, where the pen has conspicuous defect it may be possible Elimination of certain writing instrument is possible in more cases. However, individualisation of the pen is rather elusive.

10.21 PRESENTATION[23]

10.21.1 The Expert

The expert is the chief performer in the presentation of evidence. The prosecution and the defence counsels are helpers. They extract the total evidence through examination in chief, cross-examination and re-examination. The court appraises the evidence and the performance of the expert.

Basic traits of an honest and efficient expert are*:*

10.21.1.1 No Bias

The expert is not biased in favour of the prosecution or defence. He assists the court to find the truth. He presents the data he has generated, the conclusions he has drawn from the material submitted to him. He submits his findings to the court, in precise/concise/intelligible/simple language.

10.21.1.2 No Dogmatism

He is not dogmatic.

10.21.1.3 Man of Science

The expert is a man of science and does not go beyond the data he has generated. He demonstrates his evidence with adequate photographs/illustrations/d data.

10.21.1.4 Cogent reasons

He gives cogent reasons for his opinion/report. He does not go by moral conviction or hunch.

10.21.1.5 Assistance

He discusses the case with his assistants, colleagues or superiors and removes lacunae or deficiencies if any

23. For a detailed discussion, *see*: chapter 3 of this book and chapters 21–22 of BR Sharma, *Handwriting Forensics*, 2017 Edn, Publisher: LexisNexis.

10.21.1.6 Qualifications

The expert is a properly qualified person:

1. He has a degree in science.
2. He has training in the expertise.
3. He was attached with some reputed document examiner for an adequate period.
4. He is engaged in research.
5. He has ample casework experience.
6. He has liaison with professional bodies.
7. He participates in meetings/seminars/conferences on expertise.
8. He has published research papers and books.

10.21.1.7 Court Appearance

Most of the lawyers feel shy of expert evidence. They leave the matter of presentation to the expert. The expert, therefore, has to be careful in presenting the evidence. He should:

1. Qualify himself as an expert.
2. Identify the documents which he examined.
3. Certify the correctness of the report, the photographs and other graphics.
4. Submit two column charts. They are effective. If the demonstration relates to letters, digits or their short combinations, they are placed in horizontal rows as a number of letters or digits from different documents are shown.

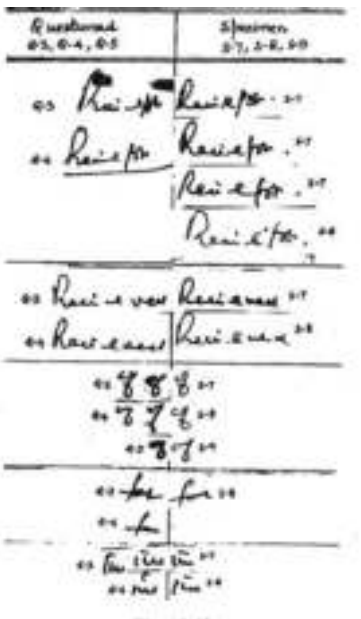


Fig. 10.56
Comparison chart of questioned and specimen writings reveals common authorship of the two documents

If it relates to long signatures or words, they are placed in vertical columns.

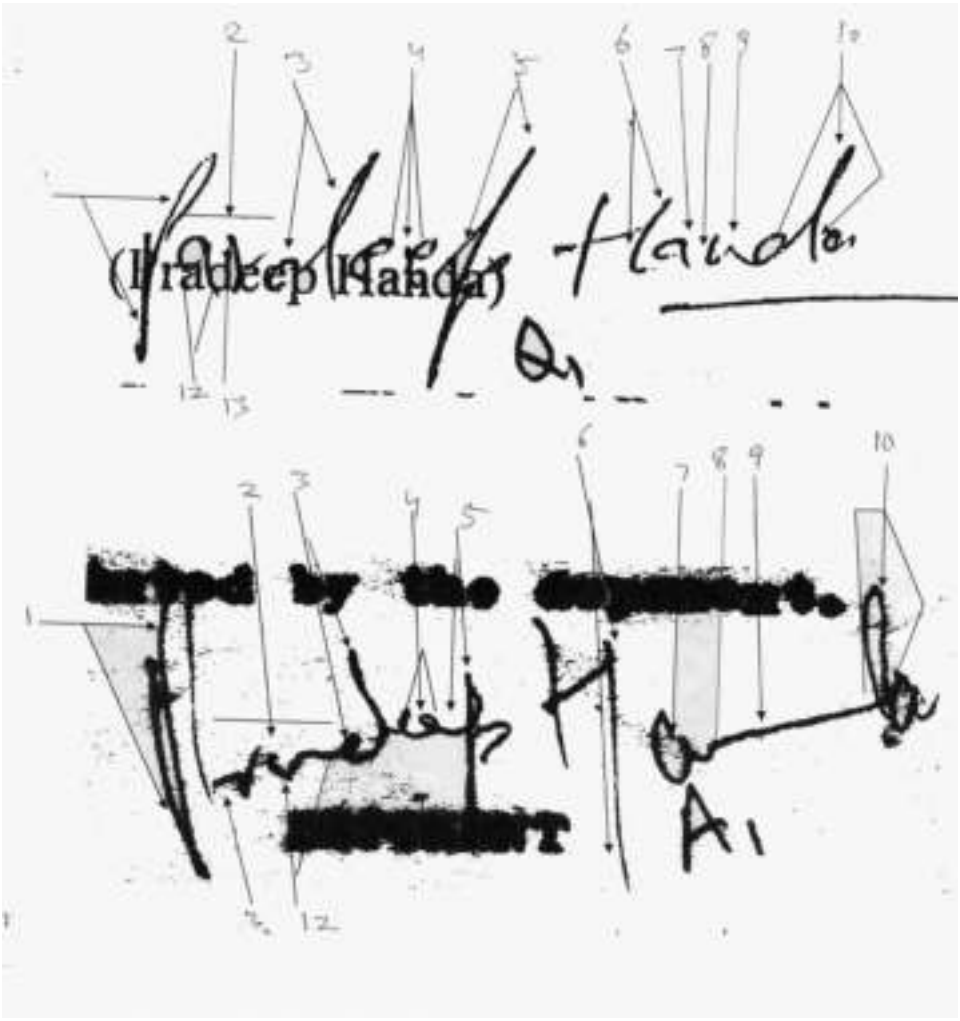


Fig. 10.57
A faithful, clear and convincing computer-generated illustration

5. The following points are kept in view:
   - The charts carry information relating to the documents from which the letters, words or digits are selected.
   - Avoid congestion on the chart.
   - Arrange letters, words, digits and figures functionally in the charts. However, as far as possible, make the chart pleasing to the eye.
   - Give explanatory notes/remarks on the chart so that the non-professionals understand/assimilate the evidence without much assistance.

- Keep magnification of photographs in the illustrative charts relating to handwritings about 2 to 5 X (times). Higher magnifications are required to show erasures, alterations, pen pauses or traces in traced forgeries.
- Number the photographic charts.
- The charts bear the signatures of the expert.
- Make the photographic charts of the size 30 x 20 cm. When larger charts are required, they are folded. Thus, the effective dimension is doubled/tripled, without increasing the external size of the chart.

The bare reports and opinions of experts are not valued. The opinions, therefore, is supported by cogent reasons/illustrations.

The presentation is quoted in layman's language, no verbosity. Technical terms, if used, are explained.

10.21.2 The evidence

The expert examines the documents in his laboratory before coming for evidence. He marks the documents for identification purposes. When the documents are produced in the court, he identifies them from those identification marks.

After the examination of the document in the laboratory, the expert sends a report of his findings to the concerned person/authority. The report is usually brief. It contains all the relevant information: date and mode of receipt, the number and nature of the documents received and examined and date and mode of dispatch,

The expert prepares a number of photographs. They are for records, illustrations, to decipher or to differentiate the writings. Some photographs are taken with infrared or ultraviolet rays or with filters in some cases. They all bear his identification marks.

Fig. 10.59
Photographic exhibits should speak for themselves

Comparison of photographic charts are prepared carefully. Two column charts are effective. If the demonstration relates to letters, digits or their short combinations, they are put in horizontal rows as a number of letters or digits from different documents are shown. If it relates to long signatures or words, they are placed in vertical columns. The following points are kept in view:

1. The charts carry information relating to the documents from which the letters, words or digits are selected.
2. Congestion on the chart is avoided.
3. Letters, words, digits and figures are arranged functionally in the charts. However, as far as possible, the chart is made pleasing to the eye.
4. The charts bear explanatory remarks and notes so that layman can understand the evidence without much assistance.
5. The photographs in the illustrative charts relating to handwritings have magnification of about 2 to 5 times. Higher magnifications are required to show erasures, alterations, pen pauses or traces in traced forgeries.
6. The photographic charts bear serial numbers, given by the expert. When they are produced in the court, they bear the court exhibit numbers.
7. The charts bear the signatures of the expert.
8. The convenient size for photographic charts is 30 x 20 centimetres. When larger charts are required, they are folded. Thus, the folded charts double/triple the effective dimension without increasing the external size of the chart.

The courts form their own opinions. A demonstration through photographs is, therefore, of great value. Mere verbal description of the findings will not carry conviction, especially if an unscrupulous person is appearing as an 'opposing expert' and misguides the court through a barrage of words.

The bare reports and opinions of experts are not valued. The opinions, therefore, is supported by cogent reasons, preferably accompanied by illustrations/photographs/charts. The efficient expert does so.

The evidence is understood by a layman only if it is presented in a proper sequence. The photographs of the size of documents are produced in important cases, followed by the illustrative charts. Each chart is presented when the evidence relating to the chart is submitted.

An experienced expert does not use technical words in his presentation. If some uncommon term is unavoidable, he explains the same. The language of the expert should not cause confusion; instead, it should simplify the technical aspects of evidence.

10.21.3 Presenting Counsel

The responsibility of proper presentation of expert evidence is mostly upon the presenting counsel. A conscientious attorney takes the following steps:

10.21.3.1 Prior Consultation

Technical evidence needs careful study and understanding. The counsel, therefore, has a conference with the expert to understand the evidence.

10.21.3.2 Examination-in-Chief

The counsel presents the evidence of the expert in the form of answers to questions. Narrative form is inferior to the question and answer form. The court loses interest in a long narrative, the questioning keeps up the interest. The presenting counsel, therefore, should:

- Establish the *bona fide* of the expert.
- Establish the *corpus delicti* by exhibiting the documents.
- Exhibit the report after getting the main statement recorded, along with graphics, data and reasons.
- Anticipate defence questions against the expert evidence and ask those questions himself to blunt the heroics of the defence counsel.
- Listen carefully to the cross-examination, take notes and prepare for re-examination.
- Ensure that the evidence produced is legal/relevant.
- Ensure that the standards produced are genuine/accepted by the accused/proved to be his.

10.21.3.3 Re-examination

The presenting counsel listens to the cross-examination carefully. He takes notes and re-examines the expert on points needing clarifications or amplifications.

10.21.4 Defence counsel

The defence plays a dramatic part in the presentation of evidence. He cross-examines the expert.

The Cross-Examination of an expert witness is not an easy and off-hand task. It needs a proper understanding of the evidence and a thorough preparation of the case. Nevertheless, it is not an impossible task as considered by some counsels. If they study the evidence and consult an expert and literature on the subject, the cross-examination can be carried out effectively.

10.21.4.1 Aim

The cross-examination of an expert witness must have a proper aim. It may be

1. To discredit the witness
2. To question his findings
4. To elicit information to support defence version of the case.

10.21.5 Cross-Examination[24]

The cross-examination of an expert witness is not an easy and off-hand task. It needs proper understanding of the evidence and a thorough preparation of the case. Nevertheless, it is not an impossible task as considered by most counsels. If they study the evidence and consult an expert and literature on the subject, the cross-examination can be carried out effectively.

24. See chapters 21–22 of BR Sharma, *Handwriting Forensics,* 2017 Edn, Publisher: LexisNexis.

The defence counsel should fix the aim of cross-examination. The main aims are to:

- Discredit the expert. It is futile to try to discredit an honest, well-qualified and experienced expert.
- Question the report/findings/inadequacy of data,
- Elicit information to support defence version of the case.

10.21.6 Judge

The judge is the ultimate authority to evaluate and utilise the expert evidence. He is to see that justice is done in every case. The expert, the prosecution and the defence counsels are just to assist him. He has to evaluate the evidence and form his own opinion. The judge, therefore, must understand the evidence and utilise it in the dissemination of justice.

The prosecution counsel may not present the evidence properly. The defence counsel tries to elicit information that is helpful to his client. Thus, only the judge is interested in real justice. He should, therefore, ascertain the facts, assimilate them and utilise them in the dissemination of justice.

The scientific methods in the detection of the crime are daily improving and are becoming accurate, sensitive, rapid and specific. However, at no stage they are unintelligible. They should be utilised.

In brief, the judge sees that:

1. The expert is honest, properly educated, trained and is engaged in professional work. The court should not permit an impostor to impose upon the court and perjure.
2. The expert evidence produced is relevant, intelligible, properly demonstrated and explained.
3. The expert does not use meaningless jargons, technical terminology or verbosity to hide the weak points in his evidence or to mislead the court to non-issues.
4. The expert has not side-tracked the relevant questions put to him by the counsel or the court.
5. The expert, the prosecution and the defence have done their duties properly, if they have not, the court should intervene at the appropriate time.
6. The expert is not forced to answer questions in "yes" or "no" answers. The scientific evidence often needs elaboration. "Yes" or "No" answers, at times, cannot do justice to the truth.
7. The counsels do not waste time in asking hypothetical questions.
8. The points left ambiguous or incomplete, either by the prosecution or by the defence, are clarified through court questions.
9. The inconclusive reports are probed to ascertain their probative values and they are given due weight accordingly. Some reports are inconclusive only technically. They must be given due weight.
10. The data conform to the standards laid down by the concerned professional body.
11. The expert has explained the apparent contradictions satisfactorily.

10.22 ADDITIONAL READINGS

1. B R Sharma, *Handwriting Forensics,* LexisNexis, 2017 Edn.
2. Huber RA and Headtrick, AM, *Handwriting Identification: Facts and Fundamentals*, CRC Press, New York.
3. Morris, R, *Forensic Handwriting Identification,* Academic Press, New York.
4. Ellen, D, *Scientific Examination of Documents,* CRC Press, New York.

APPENDIX A

10.23 BREWSTER ON HANDWRITING PRINCIPLES[25]

1. No two persons can write precisely alike.
2. Natural variations are within a range.
3. Different writing habits do not exist in the same person at the same time.
4. To change one's writing style is exceedingly difficult.
5. No one is capable of writing better or more fluently than his manual capacity or dexterity will allow.
6. It is exceedingly rare for a person to write his signature twice exactly alike.
7. Speed or pace of writing of the same person at different times is fairly constant.
8. Forger nearly always attempts to make his product as much as he can, alike the genuine.
9. Retouching is done carefully by the forger and carelessly by the genuine writer.
10. No genuine writer makes an outline of his signature by stylus or pencil and then inks it.
11. Anonymous letters are disguised by writing slowly. Disguised signatures are written quickly.
12. Hesitation, labour and care generally indicate forgery and their absence generally genuineness.
13. Two handwritings are identified as the work of the same writer if they contain both in number and degree a sufficient quantity of individualising features which cannot be due to coincidence (and *vice versa*).

APPENDIX B

10.24 SOURCES OF ADMITTED WRITINGS[26]

Item	Sources
1	Account books
2	Affidavits
3	Assignments
4	Autographs

25. F Brewster, *Contested Documents and Forgeries,* pp 1–6, Calcutta (Kolkata), 1932.
26. B R Sharma, *Handwriting Forensics*, pp 162–4,LexisNexis, 2017.

Item	Sources
5	Automobile insurance applications
6	Automobile license applications
7	Automobile title certificates
8	Bank deposit slips
9	Bank safe deposit entry records
10	Bank savings withdrawal slips
11	Bank signature cards
12	Bank statements, receipts for
13	Bible entries
14	Bills of sale
15	Bonds
16	Books, signatures of owners on covers
17	Building "after hours" registers
18	Business license applications
19	Charity pledges
20	Checkbook stubs or record, book
21	Cheeks, including endorsements
22	Church pledges
23	Convention registration books
24	Contracts
25	Cooking recipes
26	Corporation papers
27	Criminal records'
28	Credit applications
29	Credit cards
30	Deeds
31	Deeds of trust
32	Depositions
33	Diaries
34	Dog license applications
35	Drafts
36	Drive-it-yourself applications
37	Drivers' licenses and applications
38	Druggists' poison registers
39	Employment applications
40	Envelopes
41	Fishing licenses

Item	Sources
42	Funeral attendance registers
43	Gas service applications
44	Gasoline mileage records
45	Gate records at defense plants
46	Greeting and Christmas cards,
47	Hospital entry applications,
48	Hotel and motel guest registers
49	Hunting licenses
50	Identification cards
51	Inventories
52	Leases, real property
53	Letters
54	Library card applications
55	Light company applications
56	Life insurance applications
57	Loan applications
58	Mail orders
59	Manuscripts
60	Marriage records
61	Membership cards
62	Memoranda of all kinds
63	Military papers
64	Mortgages
65	Newspaper advertisement copy
66	Occupational writings
67	Package receipts
68	Parent's signatures on report cards
69	Partnership papers
70	Pawn tickets
71	Passports
72	Payroll receipts
73	Pension, applications
74	Permit applications
75	Petitions, referendum,
76	Photograph albums
77	Pleadings
78	Postal cards

Item	Sources
79	Probate court papers
80	Promissory notes
81	Property damage reports
82	Receipts for rent,
83	Registered mail return receipts
84	Releases of mortgages
85	Rental contracts for equipment
86	Reports
87	Retail store sales slips
88	School and college papers
89	Social security cards and papers
90	Sport and game score cards
91	Stock certificates, endorsements on
92	Surety bond, applications
93	Tax estimates and returns
94	Telegram copy
95	Telephone service applications
96	Time sheets
97	Traffic tickets
98	Voting registration records
99	Water company service applications
100	Wills
101	Workmen's Compensation papers.

10.25 SUPREME COURT CASE LAW

(21St Century)

10.25.1 Evidence Admissible[27]

Author's Summary

It is a case of forgery of railway receipt by an employee of the railways; by which consignment was diverted from its destination and contents usurped.

Document expert identified the handwriting of the forger. The three courts, including the SC accepted the expert opinion, which was supported by other evidence. The culprit was convicted.

Highlights italicised

27. *Alamgir v State (NCT, Delhi)*, AIR 2003 SC 282 : 2002 AIR SCW 4749 : 2003 Cr LJ 456 (SC).

Relevant Extracts (Verbatim)

In the first place, it may be noted that the appellant was at the material time a Guard in the employment of the Railway Administration with his headquarters at Agra and he had nothing to do with the train by which Wagon No. SEKG 40765 was dispatched from Munda to Bikaner, nor with the train, which carried that wagon from Agra to Ludhiana. He was not a Guard on either of these two trains. There was also no evidence to connect the appellant with the theft of the blank Railway Receipt at Banmore Station. It is indeed difficult to see how the appellant, who was a small employee in the Railway Administration, could have possibly come into possession of the blank Railway Receipt from Banmore Station which was not within his jurisdiction at any time. It is true that B. Lal, the Handwriting Expert, deposed that the handwriting on the forged Railway Receipt Ex. PW-10/A was that of the same person who wrote the specimen handwritings, Ex. PW-27/37/to 27/57, that is the appellant, but we think it would be extremely hazardous to condemn the appellant merely on the strength of opinion evidence of a Handwriting Expert. It is now well-settled that Expert opinion must always be received with great caution and perhaps none so with more caution than the opinion of a Handwriting Expert. There is a profusion of precedential authority which holds that it is unsafe to base a conviction solely on Expert opinion without substantial corroboration. This rule has been universally acted upon and it has almost become a rule of law. It was held by this Court in *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559, that it is unsafe to treat Expert Handwriting opinion as sufficient basis for conviction, but it may be relied upon when supported by other items of internal and external evidence. This Court again pointed out in *Ishwari Prasad Misra v Mohammad Isa*, AIR 1963 SC 1728 : (1963) 2 SCR 722 : 1963 BLJR 226, that Expert evidence of handwriting can never be conclusive because it is, after all, opinion evidence, and this view was reiterated in *Shashi Kumar Banerjee v Subodh Kumar Banerjee*, AIR 1964 SC 529, where it was pointed out by this Court that Expert evidence as to handwriting being opinion evidence can rarely, if ever, take the place of substantive evidence and before acting on such evidence, it would be desirable to consider whether it is corroborated either by clear direct evidence or by circumstantial evidence. This Court had again occasion to consider the evidentiary value of Expert opinion in regard to handwriting in *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197, and it uttered a note of caution pointing out that it would be risky to found a conviction solely on the evidence of a handwriting expert and before acting upon such evidence, the Court must always try to see whether it is corroborated by other evidence direct or circumstantial. It is interesting to note that the same view is also echoed in the Judgments of English and American Courts, Vide *Gurney v Langlands*, 1822 (5) B and Ald 330, and Matter of Alfred Foster's Will (34 Mich 21). The Supreme Court of Michigan pointed out in the last mentioned case.

Everyone knows how very unsafe it is to rely upon any one's opinion considering the niceties of penmanship – Opinions are necessarily received, and may be valuable, but at best this kind of evidence is a necessary evil.

We need not subscribe to the extreme view expressed by the Supreme Court of Michigan, but there can be no doubt that this type of evidence, being opinion evidence is by its very nature, weak and infirm and cannot of itself form the basis for a conviction. We must, therefore, try to see whether, in the present case, there is, apart from the evidence of the Handwriting Expert, B Lal, any other evidence connecting the appellant with the offence.

In our view, however, reliance in Magan (supra) is rather misplaced in the contextual facts since no conviction is based on the opinion of the Handwriting Expert but admittedly it can be relied upon when supported by other items of internal and external evidence. The Handwriting Expert's opinion simply corroborates the circumstantial evidence and as such we are unable to record our concurrence with the submissions of Mr. Singh on this score.

Significantly, this Court in Murarilal v State of Madhya Pradesh, AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396, in no uncertain terms observed that the hazard in acceptance of opinion of an Expert is not because it is unreliable evidence, but because human judgment is fallible. Needless to record that the signs of identification of handwriting have attained more or less a state of perfection and the risk of an incorrect opinion is practically non-existent. This Court went on further to record that doubting the opinion of a Handwriting Expert ought to be a far cry and insistence upon further corroboration as an invariable rule does not seem to be a justifiable conclusion.

In continuation of the above-noted principle, this Court went on to further examine as regards judicial precedence and in that vein stated in para 7 of the report as below:

> *"7. Apart from principle, let us examine if precedents justify in the variable insistence on corroboration. We have referred to* Phipson on Evidence, Cross on Evidence, Roscoe on Criminal Evidence, Archibald on Criminal Pleadings, Evidence and Practice and Halsbury's Laws of England *but we were unable to find a single sentence hinting at such a rule. We may now refer to some of the decisions of this Court. In Ram Chandra v State of Uttar Pradesh, AIR 1957 SC 381 : 1957 Cr LJ 559, Jagannadhadas, J, observed: "It may be that normally it is not safe to treat Expert evidence as to handwriting as sufficient basis for conviction". "May" and "normally" make our point about the absence of an inflexible rule. In Ishwari Prasad Misra v Mohammad Isa, AIR 1963 SC 1728 : 1963 BLJR 226 : (1963) 2 SCR 722, Gajendragadkar, J, observed;*
>
> *"Evidence given by Experts can never be conclusive, because after all it is opinion-evidence", a statement which carries us nowhere on the question now, under consideration. Nor, can the statement be disputed because it is not so provided by the Evidence Act and, on the contrary, section 46 expressly makes opinion-evidence challengeable by facts, otherwise irrelevant. And as Lord President Cooper observed in* Davis *v* Edinburgh Magistrate, *AIR 1953 SC 34: "The parties have invoked the decision of a judicial tribunal and not an oracular pronouncement by an Expert."*

As regards the decision of *Magan* (supra) this Court in para (10) stated as below:

> "10. Finally, we come to *Magan Bihari Lal v State of Punjab*, AIR 1977 SC 1091 : 1977 Cr LJ 711 : (1977) 2 SCC 210, upon which Sri R.C. Kohli, learned counsel, placed great reliance. It was said by this Court:
>
> *… but we think it would be extremely hazardous to condemn the appellant merely on the strength of opinion evidence of a Handwriting Expert. It is now well-settled that Expert opinion must always be received with great caution and perhaps none so with more caution than the opinion of a Handwriting Expert. There is a profusion of precedential authority which holds that it is unsafe to base a conviction solely on Expert opinion without substantial corroboration. This rule has been universally acted upon and it has almost become a rule of law. I*
>
> It was held by this Court in *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559, that it is unsafe to treat Expert Handwriting opinion as sufficient basis for conviction, but it may be relied upon when supported by other items of internal and external evidence. This Court again pointed out in *Ishwari Prasad Misra v Mohammad Isa*, AIR 1963 SC 1728 : (1963) 2 SCR 722 : 1963 BLJR 226, that Expert evidence of handwriting can never be conclusive because it is, after all, opinion-evidence, and this view was reiterated in *Shashi Kumar Banerjee v Subodh Kumar Banerjee*, AIR 1964 SC 529, where it was pointed out by this Court that Expert evidence as to handwriting being opinion-evidence can rarely, if ever, take the place of substantive evidence and before acting on such evidence, it would be desirable to consider whether it is

> corroborated either by clear direct evidence or by circumstantial evidence. This Court had again occasion to consider the evidentiary value of Expert opinion in regard to handwriting in *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197, and it uttered a note of caution pointing out that it would be risky to found a conviction solely on the evidence of a Handwriting Expert and before acting upon such evidence, the Court must always try to see whether it is corroborated by other evidence, direct or circumstantial. The above extracted passage, undoubtedly, contains some sweeping general observations. But we do not think that the observations were meant to be observations of general application or as laying down any legal principle. It was plainly intended to be a rule of caution and not a rule of law as is clear from the statement "it has *almost* become a rule of law". "Almost", we presume, means, "not quite". It was said by the Court there was a "profusion of precedential authority" which insisted upon corroboration and reference was made to *Ram Chandra v State of Uttar Pardesh* ; *Isdhwari Prasad v Mohammad Isa* ; *Shashi Kumar v Subodh Kumar* and *Fakhruddin v State of Madhya Pradesh*. We have already discussed these cases and observed that none of them supports the proposition that corroboration must invariably be sought before opinion-evidence can be accepted. There appears to be some mistake in the last sentence of the above extracted passage because we are unable to find in *Fakhruddin v State of Madhya Pradesh*, any statement such as the one attributed. In fact, in that case, the learned judges acted upon the sole testimony of the Expert after satisfying themselves about the correctness of the opinion by comparing the writings themselves. We do think that the observations in *Magan Bihari Lal v State of Punjab*, must be understood as referring to the facts of the particular case."

In *Murarilal* (supra) this Court stated that there is no rule of law, nor any rule of prudence which has crystallised into a rule of law that opinion evidence of a Handwriting Expert must never be acted upon, unless substantially corroborated.

We feel it expedient to record our concurrence therewith, though, however, we hasten to add that since human judgment cannot be said to be totally infallible, due caution shall have to be exercised and the approach ought to be that of care and caution and it is only upon probe and examination the acceptability or creditworthy of the same depends. The learned Sessions Judge, as also the High Court, did place upon consideration of all relevant facts and material on record, reliance on the opinion of the Handwriting Expert and we do not see any reason to [28]record a contra finding.

10.25.2 Specimens under section 73, I EA[29]/311 A Cr PC[30]

Author's Summary

It is a simple case of interpreting the power of the court under section 73 of the IEA. The SC ruled that the court has no powers to order any person to give specimen writing in cases under investigation. However, during trials if the court needs specimens for its own scrutiny, they have the powers to order**.** Addition of Section 311 A in Cr P C has given powers to order specimens during investigation.

Highlights italicised

28. *Murarilal v State of Madhya Pradesh*, AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396.
29. *State of Haryana v Jagbir Singh*, AIR 2003 SC 4377 : 2003 AIR SCW 5180 : 2003 Cr LJ 5054 (SC).
30. Section 311 A Cr PC was introduced as Amendment No.25 of 2005 with effect from 23.06.2006. It reads: "Power of Magistrate to order person to give specimen signatures or handwriting.-If a Magistrate of the first class is satisfied that, for the purposes of any investigation or proceeding under this Code, it is expedient to direct any person…"

Relevant Extracts (Verbatim)

We shall examine the circumstances highlighted. So far as ransom notes are concerned, prosecution sought to rely upon the report given by the handwriting expert. It appears that the accused was taken before Addl. Chief Judicial Magistrate, Bhiwani. According to him, on 10 September 1991 the accused was brought before him in custody for giving his specimen signature under section 73 of the Evidence Act. It was noticed by this Court in *State of Uttar Pradesh v Ram Babu Misra*, AIR 1980 SC 791 that the Chief Judicial Magistrate has no power to direct the accused to give his specimen signature for comparison during investigation. Section 73 of the Evidence Act reads as follows:

> ***73. Comparison of signature, writing or seal with others admitted or proved.*** In order to ascertain whether a signature, writing or seal is that of the person by whom it purports to have been written or made, any signature, writing, or seal admitted or proved to the satisfaction of the Court to have been written or made by that person may be compared with the one which is to be proved, although that signature, writing, or seal has not been produced or proved for any other purpose.

The Court may direct any person present in Court to write any words or figures for the purpose of enabling the Court to compare the words or figures so written with any words or figures alleged to have been written by such person.

This section also applies, with any necessary modifications, to finger-impressions.

The second paragraph of section 73 enables the Court to direct any person present in the Court to give specimen writings "for the purpose of enabling the Court to compare" such writings with writings alleged to have been written by such person.

The clear implication of the words for the purpose of enabling the Court to compare is that there is some proceeding before the Court in which or as a consequence of which it might be necessary for the Court to compare such writings. The direction is to be given for the purpose of enabling the Court to compare and not for the purpose of enabling the investigating or other agency "to compare". If the case is still under investigation there is no present proceeding before the Court in which or as a consequence of which it might be necessary to compare the writings. The language of section 73 does not permit a Court to give a direction to the accused to give specimen writings for anticipated necessity for comparison in a proceeding which may later be instituted in the Court.

10.25.3 Admissibility of Reports *(section 293 Cr PC)*[31]

Author's Summary

In this case, the report of a handwriting expert was accepted by the appellate court under section 293 of Cr P C. The expert was not examined. The defense stressed that the report of the expert, as such, is no evidence. The SC agreed with the defense as the document expert is not one of the specified experts in section 293 of Cr PC and order to call the expert to prove his report, with opportunity to defence for cross-examination.

Highlight italicised

31. *Sonam Tshering Bhutta v State of Sikkim*, 2004 Cr LJ 3136 (SC).
Also see: *Nirmal v State of Punjab*, 2002 Cr LJ 447 : 2001 (4) All Cr LR 219 : 2001 (4) Rec Cri rule 623 ; *State of Maharashtra v Damu Gopinath Shinde*, AIR 2000 SC 1691 (1700) : 2000 AIR SCW 1617 : 2000 Cr LJ 2301.

Relevant Extracts (Verbatim)

Reports of Document Expert not covered under section 293 Cr PC.

Mr. Singh, learned Counsel for the petitioner submitted that the petitioner has been found guilty solely on the basis of the report of the Government Examiner of Questioned Documents, Exhibit 29, but the expert who submitted the said report was not examined and his report was proved by the Investigating Officer which is not permissible. By referring to sub-section (4) of section 293, Cr PC, he submitted that report of those government scientific experts mentioned therein can be admitted into evidence without they being examined, but in the instant case the hand writing expert was the Deputy Government Examiner and the said expert is not one of the experts mentioned in sub-section (4) of section 293, Cr PC Mr. Pradhan, learned Additional Public Prosecutor, on the other hand, submitted that the conviction of the petitioner is not based solely on the report of the hand writing expert. There is also other evidence on record which justifies his conviction.

I have perused the impugned judgment and on its close scrutiny it appears that the learned sessions Judge has not discussed the evidence on record at all. In para 7 of the judgment he has referred to the arguments of the Public Prosecutor who seems to have submitted before him that for different offences committed by the petitioner, there is evidence of certain PWs and separate documentary evidence.

It may be stated that as an appellate Court, the learned Sessions Judge is required to assess and consider the evidence on record independently. As a court of appeal, he has to remember and keep in view that the presumption of innocence of the accused continues and therefore, he is to satisfy himself that the judgment of the trial Judge is correct. It is the bounden duty of the appellate Court, which may be the final Court of fact, to go through the evidence for himself, to assess it in proper perspective and to come to an independent finding. On careful examination of the impugned judgment, I have no hesitation to hold that the learned Sessions Judge has failed to discharge his duty as an appellate Court. As indicated above, he has simply summarised the submissions made before him by the learned Public Prosecutor and has not cared to examine and scrutinise the evidence for himself. For the reasons aforesaid, the impugned judgment is vulnerable and, therefore, the appeal needs rehearing by him.

There appears to be a force in the submission of the learned counsel for the petitioner with regard to the report submitted by the Deputy Government Examiner and Assistant Government Examiner of Questioned Documents. Section 293, Cr PC dispenses with the proof of certain documents unless the court itself thinks it necessary to be proved. Sub-section (4) thereof provides that the said section applies to those Government Scientific experts mentioned therein. So far as handwriting expert is concerned, the Director of the Finger Print Bureau has been mentioned as the expert. It means that if the report is submitted by the Director of Finger Print Bureau, the same may be admitted into evidence without he being formally examined. But in the present case, Exhibit 29 was not made by the Director of Finger Print Bureau. Therefore, it is necessary that handwriting expert who prepared Exhibit 29 should be examined to prove the contents thereof, in the interest of justice. The learned Sessions Judge is directed to summon the expert and examine him as a witness. For this, prosecution will take necessary steps. After he is examined, the learned Sessions Judge will give adequate opportunity to the defence to cross-examine the witness. The evidence of the said witness will form part of the record and be available to be considered along with other evidence already on record.

From a perusal of the above it would be clear that section 293, Code of Criminal Procedure applies only to certain experts like Chemical examiner or Assistant Chemical Examiner to the

Government. Chief Inspector of Explosives, Director of the Finger Print Bureau, Director, Deputy Director or Assistant Director of a Central Forensic Science laboratory or a State Forensic Science Laboratory and the Serologist to the Government, besides Director of Haffkeine Institute, Bombay.

The report of the handwriting expert, even if it has been given by the expert working in the Forensic Science laboratory, would not be per se admissible under section 293, Code of Criminal Procedure unless the maker of the said report is summoned and examined as a witness and the other side is given opportunity to cross examine the witness. In my opinion, there was absolutely no occasion for the learned Sessions Judge to have observed that the report of the handwriting expert was admissible under section 293, Code of Criminal Procedure and could be allowed to be tendered into evidence without summoning the author of the report.

In *State of Maharashtra v Damu Gopinath Shinde,* 2000 AIR SCW 1617 : 2000 Cr LJ 2301 : AIR 2000 SC 1691 (1700) opinion of the Assistant State Examiner of documents was produced in evidence as Ex. 64. Under these circumstances, it was held by their Lordships of the Supreme Court that from that description alone, it could not be gathered whether his office would fall within the purview of section 293 Code of Criminal Procedure and hence without examining the expert as a witness in the court, no reliance could be placed on Ex. 64.

In view of the above, in my opinion, even if the prosecution was allowed to produce the report of the handwriting expert by way of additional evidence, the learned Sessions Judge, had gone wrong in allowing the prosecution to tender the said report of the handwriting expert in evidence, without examining the expert and allowing opportunity to the accused to cross-examine him. As referred to above, this was contrary to law, inasmuch as such a report would not be covered under section 293, Code of Criminal Procedure.

For the reasons recorded above, while upholding the order of the learned Sessions Judge, allowing the prosecution to produce the report of the handwriting expert by way of additional evidence, the present petition is partly allowed and the order dated 23 September 2000, passed by the learned Sessions Judge, is modified and

it is directed that for proving the report of the handwriting expert, the prosecution would be given opportunity to examine the expert, who had given the said report and the accused would have the right to cross-examine the said witness.

10.25.4 Forgery: (addition)[32]

Author's Summary

In this case, a borrower took a loan of Rs 25000/- from a moneylender and wrote a promissory note. The money lender added digit "1" to the figure to increase the amount to Rs 125000/= in the promissory note. The victim admitted his signatures etc. on the document but not the amount. An expert found the forged addition of digit "1". The trial court accepted the expert's report and rejected lender's claim. The case, ultimately, came up in SC. It agreed with the trial Court and did not accept the lender's claim.

Highlight italicised

32. *Tatipamula Naga Raju v Pattem Padmavathi,* AIR 2011 SC 1499 : (2011) 4 SCC 726 : 2011 AIR SCW 2168.

Relevant Extracts (Verbatim)

2. The suit had been filed by the plaintiff (the respondent herein) for recovery of Rs 1,90,000 from the defendant, who is the appellant herein, with interest and the claim was based on a promissory note, which was alleged to have been executed by the defendant for Rs 1,25,000. The trial court dismissed the suit in the circumstances stated hereinbelow.

3. The case of the plaintiff was that a sum of Rs 1,25,000 had been borrowed by the defendant and the defendant had, therefore, executed a promissory note for Rs 1,25,000 on 18 September 2001. In spite of demand, as the amount was not repaid, the plaintiff was constrained to file Original Suit No. 933 of 2003 for recovery of the said amount along with interest thereon.

9. Being aggrieved by the order passed in the appeal, the defendant filed Second Appeal No. 587 of 2008 in the High Court of Andhra Pradesh and the said appeal was dismissed by the High Court because no substantial question of law was involved in the appeal.

10. We have heard the learned counsel and have considered the judgments of all the courts. the evidence of the mediators, in whose presence the dues of the defendant had been settled and Nanaji, son of the plaintiff was paid Rs 90,000 in full settlement of Rs 1,25,000 borrowed by the defendant from Nanaji. The defendant had admitted the earlier transactions, which he had with the son of the plaintiff.

In our opinion, the evidence of the mediators and the handwriting expert was duly considered and appreciated by the trial court and the trial court had come to a right conclusion. There was absolutely no reason for the lower appellate court to arrive at a different conclusion than the one arrived at by the trial court. We are, therefore, of the opinion that the findings arrived at by the trial court are absolutely correct and no justifiable reasons have been given by the lower appellate court for arriving at a different conclusion.

11. *In our opinion, simply because the defendant had fairly admitted his signature, the court should not have come to the conclusion that the amount was payable by the defendant especially when there was an expert evidence that figure "1" was added so as to make the figure 1,25,000 from figure 25,000*

and when the mediators had deposed to the effect that there were transactions between the defendant and the son of the plaintiff and in pursuance of the said transaction, promissory notes were executed by the defendant and one of the promissory notes was not returned to the defendant. The explanation given by the defendant, which was supported by ample evidence, ought to have been considered by the lower appellate court and the lower appellate court should not have been guided by a mere fact that the defendant had admitted execution of the promissory note. In our opinion, in such a set of circumstance, the defendant ought not to have been saddled with a liability to pay the amount in pursuance of the tampered promissory note for which no consideration had ever passed from the plaintiff to the defendant.

12. As the High Court did not find any substantial question of law, it did not entertain the second appeal.

13. ***For the aforestated reasons, we are in agreement with the conclusion arrived at by the trial court and, therefore, we set aside the order passed by the High Court as well as the order passed by the lower appellate court and restore the order passed by the trial court whereby the suit had been dismissed.***

10.25.5 *Prima Facie* Case from Handwriting[33]

Author's Summary

It is case in which arbitration between two real brothers was to resolved. However, one brother forged a document 'Retirement Deed' which is purported to dispense with the Arbitration. However, an expert found the document forged It caused confusion among the lower judiciary. It appointed one SC judge as the arbitrator to decide all issues relating to the dispute.

Highlight italicised

Relevant Extracts (Verbatim)

The dispute in this case is between brothers. The appellant, Sunder Kukreja filed a petition under section 20 of the Arbitration Act, 1940 praying for the appointment of an arbitrator. The parties are real brothers and were carrying on business with each other in the name and style of D.R. Kukreja and Company. Their mutual rights and obligations were governed by partnership deeds, the last of which was executed on 10 July 1984.

In terms of clause 11 of the said deed, disputes arising between the parties had to be resolved by way of arbitration before a sole arbitrator to be nominated by the parties. Clause 11 reads as follows:

> "11. In the event of any dispute or disputes arising between the parties in the running of the partnership business or any matter relating to partnership, it shall be referred to a sole arbitrator, agreed to in writing by the parties and the award given by the sole arbitrator shall be binding on all the parties. In case the parties cannot agree to a sole arbitrator, the matter will be decided in accordance with the Arbitration Act, 1940."

> *6. It was contended by the respondents true that the partnership was dissolved by the parties with mutual consent in terms of the retirement deed dated 16 August 1990 alleged to have been executed by the appellant. However, the appellant denied executing any such retirement deed.*

Subsequently, the petition under section 20 of the Arbitration Act was filed by the appellants seeking a direction for filing the arbitration agreement dated 10 July 1984 in the court and for reference of the dispute between the parties to arbitration in terms of clause 11 thereof.

It was alleged in the petition under section 20 that disputes relating to payment of profits earned by the partnership firm and the interest on the said amount had arisen between the parties which called for adjudication by the arbitrator under clause 11. The petitioner further alleged that the respondent had been mismanaging the affairs of the partnership by employing undesirable elements and other dubious means, thereby disentitling himself to remain in control of the partnership.

The said petition under section 20 was opposed by the respondent herein who filed a written statement contending that the petitioner has misrepresented the true facts and that there was no subsisting arbitration agreement between the parties in the light of the retirement deed dated 16 August 1990 allegedly executed by the petitioners by which the partnership between the parties stood dissolved and all claims stood completely satisfied. It was also alleged that the petitioners had not come to the court with clean hands and had

33. *Surender Kukreja v Mohan Lal Kukreja,* AIR 2009 SC 2108 : (2009) 4 SCC 585 : 2009 AIR SCW 2691 : (2009) 4 Scale 529.

deliberately omitted to mention the fact of their retirement from the business under the retirement deed.

> *The genuineness of the retirement deed was, however, challenged by the appellants herein (the petitioners in the petition under section 20) who asserted that no retirement deed had been executed by them. According to the petitioners, the alleged retirement deed was a forged and fabricated document which was never executed by the petitioners, and which was prepared to somehow usurp the share belonging to the other partners in the firm without settling the accounts.*
>
> *By an order dated 1 May 1996, the learned Single Judge hearing the arbitration petition referred the disputed deed of retirement for examination and opinion to the Central Forensic Science Laboratory (CFSL). The document in question was accordingly examined by CFSL which reported that the alleged signatures of the petitioners on the alleged retirement deed were not genuine. The learned Single Judge held that the plea that there was no dispute because of the alleged retirement deed and receipts can be easily gone into by the arbitrator, and in view of the report of the forensic expert, between the parties it cannot be prima facie said that the dispute does not whilst. The report of the forensic expert creates a substantial doubt in the stand taken by the respondent of the alleged retirement of the appellant from the partnership.*

In appeal, however, the Division Bench of the High Court was of the view that in case there is a dispute as to the very existence of an arbitration clause by reason of supersession of the agreement in which the same is contained by another subsequent agreement arrived at between the parties the said dispute cannot be referred to arbitration. The Division Bench hence set aside the judgment of the learned Single Judge and remanded the matter to the learned Single Judge for a fresh consideration of the question whether the alleged retirement deed was never executed between the parties.

In our opinion the learned Division Bench was not correct in holding that the dispute should not have been referred to the arbitrator in view of the alleged retirement deed dated 16 August 1990. The very genuineness of the said retirement deed was challenged and in fact the forensic expert, gave a report that it was not genuine. The learned Single Judge has recorded prima facie satisfaction that the dispute had not become dead. Hence, in view of the decision of this court in Shree Ram Mills Ltd v Utility Premises Pvt Ltd, JT 2007 (4) SC 501 it would have been appropriate to have left the question regarding the genuineness of the alleged retirement deed to be decided by the arbitrator.

In view of the above discussion, *we set aside the decision of the Division Bench and we appoint Mr. Justice DP Wadhwa, retired Judge of the Supreme Court as the sole arbitrator to decide the dispute between the parties, including the dispute whether the alleged retirement deed was genuine or not. Hon'ble Mr. Justice DP Wadhwa can fix his own terms of emoluments and other requirements*.

10.25.6 Wrong Report Discarded: Ocular Evidence Accepted[34]

Author's Summary

It is a simple case of signature denial. It was proved false as the postman who delivered the receipt said that he saw the person signing. The liar but an expert who denied that were the signature were not his (Incompatible Standards?). The court accepted the ocular version.

Highlight italicised

Relevant Extracts (Verbatim)

The respondent allegedly gave a hand loan or Rs 1,20,000 to the appellant on 4 October 2000. In discharge of the said debt the appellant is said to have issued two cheques for Rs 60,000

34. *P Venugopal v Madan P Sarathi,* AIR 2009 SC 568 : (2009) 1 SCC 492 : (2009) 1 SCC (Cri) 554.

each on 26 April 2001 and 5 April 2001. The said cheques were presented before the bank on 10 July 2001 and were returned dishonoured on the ground that sufficient fund therefor was not available.

Upon service of notice upon the respondent, a criminal complaint was filed. By an order dated 20 November 2002, cognizance of the offence under section 138 of the Negotiable Instruments Act, 1881, was taken by the learned Magistrate.

Before the learned trial judge, the parties examined themselves. One of the contentions, raised by the appellant was that there did not exist any relationship of creditor and debtor between the parties. It was furthermore urged that notice in terms of the proviso appended to section 138 of the Negotiable Instruments Act, was not served upon the appellant.

Learned Additional Metropolitan Magistrate upon considering the materials brought on record by the parties, including the report of a handwriting expert, opined that the signatures appearing on Exhibit P-II (Postal Acknowledgment) was not that of the appellant.

The signature of the appellant on the said postal acknowledgement was compared with his signatures on the cheques. The respondent, however, examined the postal peon BA Subramanium as PW-2. He stated that he knew the appellant very well. The learned Metropolitan Magistrate did not place any reliance upon the said report of the handwriting expert and held that the notice was in fact served upon the appellant. It was also not disputed that the address of the appellant slated by the complainant was the correct address.

10.25.7 Expert Evaluation Indispensable[35] (Time Gap in Disputed and Standard Writings)

Author's Summary

It is a case of disputed Will of lady Uma. She Willed her property to a Mission Gaydia). Her real sister disputed that the Will is forged. The case went to High Court. It gave the property to the sister after comparing the signature and finding other lacunae.

Mission went to SC. It decided that the court should have taken the fact of registration of the Will/Codicil and sent the case to an expert as requested by the mission.

Highlight italicised

Relevant Extracts (Verbatim)

Brief facts of the case are that one Narendra Nath Bose, resident of Allahabad and working as Lecturer, Government Girls' Inter College, Gonda (U.P.) was having his family consisting of his wife Radha Rani Bose and three daughters, (i) Asha Bose, (ii) Uma Bose, and (iii) Shobha Bose (respondent herein). All the three sisters (daughters of deceased Narendra Nath) decided not to marry. Kum. Asha Bose died on 9 June 1990.

Kum. Uma Bose was serving as a Lecturer in Government Girls College, Gonda, UP and was a disciple of "Gaudia Mission" (hereinafter referred to as "the Mission") a Society, registered under the Societies' Registration Act, 1860 (appellant herein). She was closely associated with the activities of the Mission and also got printed various religious books and literature for the Mission by spending considerable amount. It is the case of the appellant that after her retirement from the College, she was living in Vrindaban and not with her sister Kum. Shobha

35. *Gaudiya Mission v Shobha Bose,* AIR 2008 SC 1012 : 2008 AIR SCW 564 : (2008) 1 SCALE 390.

Bose-respondent at Allahabad. She continued to take interest in the activities of the Mission. Because of her attachment and dedication towards work of the Mission, she executed a Will on 28 December 1994 bequeathing her properties in favour of the Mission. The Will was duly registered. On 9 September 1996, said Kum. Uma Bose executed a Codicil in favour of the appellant Mission in relation to certain further sums and movable properties which had come to her share and also her share in immovable properties at Vrindaban. The Codicil was also registered on 19 September 1996. On 18 November 1996, Kum. Uma Bose died in Vrindaban.

According to the appellant Mission, Kum. Shobha Bose-respondent No. 1 herein-real sister of late Uma Bose, never kept any relation with her and never looked after her and continued to stay at Allahabad only. It is the case of the appellant that in 1997, respondent No. 1 Kum. Shobha Bose applied for a Letter of Administration to the estate of deceased Kum. Uma Bose concealing real facts, of Will and Codicil in favour of appellant-Mission. The Letter of Administration was granted to her on 26 September 1997 but on application at the instance of the appellant Mission, the certificate was cancelled. The appellant-Mission applied for Probate for the Will executed by deceased Kum. Uma Bose by filing Probate Case No. 174 of 1997 before the Division Bench of Allahabad High Court. The application was, however, withdrawn by the appellant with the liberty to file fresh proceedings. Respondent No. 1-Kum. Shobha Bose filed Testamentary Suit for the estate of deceased Kum. Uma Bose. The appellant-Mission filed its objections to the said suit and claimed that it was the appellant who was entitled to the property of deceased Uma Bose and Kum. Shobha Bose had no right, title or interest in the estate of late Kum. Uma Bose. Issues were framed by the court and witnesses were examined. Respondent No. 1-Kum. Shobha Bose produced a sale deed said to have been executed by Kum. Uma Bose long back and contended that signature on the sale deed and that in the Will did not tally. The appellant-Mission applied to the High Court that the signatures be examined by handwriting expert. But the prayer was not granted by the court.

The matter was then heard by a Single Judge of the High Court and by judgment and order dated 28 March 2006, the learned Judge himself compared the handwriting of deceased Kum. Uma Bose in sale deed and in the Will and held that the Will was surrounded by suspicious circumstances. He also observed that the deceased was not living in Vrindaban and was not being looked after by the Mission as claimed by the Mission. He held that Kum. Shobha Bose was the real sister of deceased Kum. Uma Bose. In that capacity, she was entitled to a Letter of Administration of the estate and credits of late Kum. Uma Bose. The court consequently ordered payment of amount received from the Bank by the deceased to Kum. Shobha Bose holding that she was entitled to the said amount. She was also held to be the owner of the house. The learned Judge also imposed cost of Rs 25,000 on the Mission-appellant herein.

Being aggrieved by the order passed by the trial court (Single Judge), Special Appeal was filed by the appellant herein before the Division Bench of the High Court which, as stated above, was dismissed *in limine* by the Division Bench holding that the view taken by the Single Judge was correct and appeal did not require admission. Hence, the present appeal has been preferred by the appellant-Mission.

The counsel made serious grievance against the order passed by the learned Single Judge and confirmed by the Division Bench on the ground that they had committed a grave error in comparing signatures and hand-writings of deceased Kum. Uma Bose on sale deed and in the Will and in coming to the conclusion that the signatures and the hand-writings differed and they were not of one and the same person.

The counsel urged that this court has held in several cases that no comparison of hand-writing should be made by a court as it is the function of an expert. It is dangerous, hazardous and risky to

record a finding on comparison of hand-writings on different documents and it should be avoided. In the instant case, though the said objection was taken before the trial court by the appellant and an application was also made to send the hand-writings to experts, the prayer was rejected and the court proceeded to undertake the exercise which was not warranted. But, even otherwise, the appellant contended that the court was in error in comparing handwritings of Kum. Uma Bose in the Will on the one hand and in the sale deed on the other hand. So far as sale deed is concerned, it was said to have been executed in 1987 whereas Will was executed in 1994. There was thus substantial time lag between the sale deed and the Will and the said important and vital fact had not been considered properly by the learned Single Judge.

Bare reading of the aforesaid provision leaves no room for doubt that it is a regular appeal and all questions *i.e.,* questions of fact and of law are open to urge before the appellate court. In the circumstances, it was expected of the Division Bench to consider all submissions and contentions of the parties.

We are also of the view that the argument of the learned counsel for the appellants that the Will as well as Codicil were executed in 1994 and 1996 and both were duly registered, was one of the relevant factors which ought to have been kept in mind by the Division Bench. Again, even if it is held that a court of law has power, authority and jurisdiction to compare hand-writings under section 73 of the Evidence Act, the point raised as to whether on the facts and in the circumstances of the case and in the light of an application made by the appellant-Mission that they may be sent to hand-writing expert, the court should have undertaken the exercise of comparison of handwritings was a relevant issue. This is coupled with the fact that the sale deed said to have been executed by deceased Kum. Uma Bose was of 1987 and Will and Codicil were of 1994 and 1996 respectively.

10.25.8 Expert Evidence not Essential[36]

Author's Summary

It is a simple case of fraud where the marks of various relevant papers have been changed. However, the fraudster made such blunder that the forger was easily identified.

The case did not involve Handwriting or other Forensics.

Highlight italicised

Relevant Extracts (Verbatim)

Prosecution version as unfolded during trial is essentially as follows:

A-1 is the son of A-2, who was running a nursing home at Ernakulam during the relevant period and A-4 was an Assistant Registrar, Examination Wing, Kerala University. A-1 was a Pre-degree student during the academic years 1978–79 and 1979–80 in the Mar Ivanios College, Thiruvananthapuram, affiliated to the Kerala University. He appeared for the first year Pre-degree examination in April, 1979 and for second year Pre-degree examination in April/May 1980. After the second year examination, A-1 got following marks as indicated in the mark list issued by the Mar Ivanios College:

English	204/300
Hindi	109/150
Physics	127/150

36. *AS Krishnan v State of Kerala,* AIR 2004 SC 3229 : (2004) 11 SCC 576 : 2004 Cr LJ 2833 (SC).

Chemistry	131/150
Biology	129/150
Grand total	700/900

Total for the optional subjects, *viz.,* Physics, Chemistry and Biology was 387 out of 450. The above mark list issued by the Kerala University to A-1, through Mar Ivanios College, Thiruvananthapuram was received by both the appellants with their acknowledgment in the mark lists kept in the college. As both appellants were aware that the marks secured by the A-1 were insufficient to get an admission in any medical college for the First Year MBBS Course in Kerala on merit, they entered into a criminal conspiracy along with A-3 and A-4 and some day between 30 June 1980 and 10 October 1980 for forging a mark list showing higher marks and pursuant to such conspiracy A4 in the case procured a blank mark list of Pre-degree examination and by fraudulent means and without the knowledge and authority of the Controller of Examinations (PW-1) got the impression of the facsimile signature of PW-1 and the University emblem seal affixed on the blank mark list form. A-4 wrote in his own handwriting falsely and fraudulently the following marks in the forms to have been secured by A-1 in the Pre-degree final year examination:

English	:	204/300
Hindi	:	109/150
Physics	:	142/150
Chemistry	:	140/150
Biology	:	138/150
Grand total	:	733/900

In addition total of 420 marks out of 450 marks was shown for the optional subjects, *viz.,* Physics, Chemistry and Biology. A-4 forged the initials of the concerned section assistants, who actually prepared the true mark list issued through Mar Ivanios College and received by A-1 and A-2. A-4 also attested a true copy of the mark list (Ext. P-27). He forged with his designation and seal and entrusted both the forged mark list and its true copy attested by him (Ext. P-27) to A-1 and A-2. Ext. D-4 is the forged mark list. A-1 and A-2 thereafter prepared an application form for admission to a Medical College during the year 1980–81 with their signatures by incorporating the marks found in Ext. D-4, the forged mark list fully knowing the forged nature of Ext. D-4 and forwarded such application together with the attested true copy Ext. P-27 of Ext. D-4 to the Medical College, Thiruvananthapuram with the fraudulent intention to make the concerned authorities to believe that the marks shown in the application are the real marks obtained by A-1 and thereby cheated the Selection Committee and obtained admission for the First Year M.B.B.S. course on merit basis. Appellants with the intention of causing disappearance of the evidence of the commission of the crime destroyed the true genuine mark list/the true copy of which is marked as Ext. D-8 in this case received by them from Mar Ivanios College and thus the appellants and the other acquitted accused committed the alleged offences. A-3 was an associate of A-2.

6. Certain factual aspects need to be noted in the present case. Though, criticism was levelled against the analysis made by the High Court to find out how on the basis thereof it was held that the document was forged one, we find no substance therein. It was clearly conceded before the High Court that D-4 was a forged document. What was urged before the High Court was that even if it is forged, the appellants had not used it deliberately or intentionally as a forged document. A comparison of the mark sheet filed by A-1 with the marks register shows great variance.

The High Court has noticed that the appellants had asked for revaluation of the first year pre-degree answer sheets as they were not satisfied with the marks shown in the mark list and claiming that A-1 should have obtained more marks. Evidence was let in by the prosecution to indicate that in Part II Examination, optional subjects are there and the subjects are Physics, Chemistry and Biology and the maximum one can get in one of the above optional subjects is 150 marks and 45 marks were required to be obtained to pass. Part I consists of English and language other than English. As noticed by the High Court, Part II (optional subjects) each subject consists of Paper I, Paper II and practical. The examination for Paper I is conducted in the first year, where A-1 appeared in 1979. Paper II is written in the second year of the course and A-1 undisputedly appeared in the year 1980. The total marks of 150 are split as follows:

Paper I (1st year) 40 marks
Paper II (2nd year) 60 marks
Practical 50 marks

It has not been disputed by the appellants that the marks obtained by A-1 in the first year for Paper I were known. What they had done was to ask for revaluation. A-1 had obtained 24, 33 and 35 marks in Physics, Chemistry and Biology (as evidenced by Ext. P-2). *There is no provision for seeking revaluation for practical examination and it is only restricted to theory papers. Unless one knows the marks secured in a particular examination, the question of seeking revaluation does not arise. Though a claim was made that the result of re-valuation was not known so far as 1st year is concerned, the evidence on record clearly proves to the contrary. In the communication relating to results of revaluation it had been clearly indicated that there was no change in the marks. Obviously, the marks are shown in excess of the actual in Exh. D-4 can be related to Paper II. The excess marks are 33, i.e., 15, 9 and 9 in Physics, Chemistry and Biology respectively. As per Exh. D-4 the marks indicated are 142, 140 and 138 for the aforesaid three subjects. The High Court has taken pains to analyse that for the second year in respect of Paper II the maximum marks are 60 in the aforesaid three subjects. If by way of illustration, Physics marks are taken, originally before revaluation the mark secured by A-1 was 55 and if excess 15 marks are added to it, as the allegedly forged document shows the total comes to 70 marks. If the total marks for a paper are 60, there cannot be even a shadow of doubt that A-1 could not have secured 70 marks. Similar is the case of Biology, where the marks would be 61 against total maximum marks of 60, of course in Chemistry 59 marks are shown as against maximum 60 marks. If a student gets cent per cent marks in paper II in each subject the total would come to 180, whereas on the basis of D-4 it comes to 190. This impossible difference would have attracted notice of A-1 and A-2. They are not illiterate persons. As claimed by learned counsel for the appellants, A-1 was a brilliant student and A-2 was a reputed doctor and that they would miss this simple aspect in mark list is not only possible, to believe, but also would be against normal human experience. The High Court also on the basis of evidence tendered by PW-60, came to conclude that in the first year for Paper I the total marks secured by A-1 was 92 and practical marks were 138. Even if it is conceded for the sake of arguments, as submitted by learned counsel for the appellant, that A-1 secured cent per cent marks in Paper II the total marks would have come to 92+138+180 which would make a total of 410, and not 420 as Ext. D-4 shows.*

Another interesting feature has been noticed by the High Court to show how it would have been impossible for A-1 and A-2 to overlook something tainted appearing to even naked eyes. Exh. D-4 is dated 30 June 1980. It was not disputed before the High Court that the results were published for the first year degree course on 30 June 1988. If the results were published on 30 June 1980, Exh. D-4 which is purported to have been drawn up after revaluation could not have indicated a date seal of 30 June 1980. These factors clearly go to show that A-1 and A-2 had sufficient knowledge

that there was a forgery and they had used the document knowing it to be forged. The pretended ignorance stood belied and self-condemned on the indisputable materials on record. The plea of innocence as presently advanced has no substance.

10.25.9 Strictures on Prior Reports[37]

Author's Summary

It is a straightforward case of forgery. A bank employee got a cheque book issued in the name of a customer and withdrew through cheques over a lakh of rupees. The customer reported the fraud. The bank management found the culprit, proved his depredation through a handwriting expert and dismissed him after holding an inquiry.

In defense, the forger said that the report of the expert cannot be used as his expertise is tainted due to stricture. The SC held that prior strictures do not prevent acceptance of reliable evidence.

Highlight italicised

Relevant Extracts (Verbatim)

Order of dismissal from service having been restored by Division Bench of Delhi High Court setting aside judgment of the learned Single Judge, this appeal has been filed.

Factual background filtering out unnecessary details is as follows:

> Appellant (hereinafter referred to as "the employee") joined services of the Lakshmi Commercial Bank in 1976 as a Clerk. The said bank was merged with Canara Bank (hereinafter referred to as 'the employer') in October 1985. As a consequence, services of the employee stood transferred to the employer-Bank. He was posted as a Clerk in Deen Dayal Upadhyay Marg, New Delhi Branch and was deputed to work at AIWC extension of the said branch.

One customer of the Bank *i.e.,* SV Deshpande, advocate lodged a complaint with the police stating that there has been unauthorised withdrawal of Rs 1.07 lakhs from his account in the Bank. An internal investigation was also undertaken by the employer in respect of the complaint. Report of the preliminary investigation was submitted and the employee was served with charge-sheet along with imputations of misconduct to the effect that the employee was responsible for the unauthorised withdrawal from the customer's account.

Enquiry Officer was appointed to hold the enquiry and along with other witnesses the evidence of Handwriting Expert Mr. VK Sakhuja was tendered. The proceedings in the enquiry were concluded on 29 April 1993. Both the parties were asked to submit their written submissions. At this stage the employee filed an application for further cross-examination of a Handwriting Expert. Said prayer was rejected on 10 May 1993. The Enquiry Officer submitted his report and the employee was also furnished with a copy to make his submissions as regards the findings. The written submissions were submitted on 24 June 1995. Findings of the Enquiry Officer were recorded. Thereafter order of dismissal was passed.

The Disciplinary Authority concurred with findings of the Enquiry Officer after taking into account the submissions made by the employee. The charge sheet contained the following allegations:

37. *Lalit Popli v Canara Bank,* AIR 2003 SC 1796 : (2003) 3 SCC 583 : 2003 AIR SCW 1238.

On the 11th of May, 1992, a charge-sheet was issued to the petitioner in the following terms:—

Whereas, there are *prima facie* grounds for believing that you have committed gross misconduct, the particulars whereof are given below, this charge-sheet has been drawn up against you and you are required to submit me within 15 days of receipt of this charge-sheet a statement in writing setting forth your defence, if any and showing cause as to why suitable action should not be taken against you.

CHARGE

You have been working at Canara Bank, DDU Marg, New Delhi Branch since 7 March 1986.

One Mr. SV Deshpande, Advocate, Supreme Court of India is maintaining his SB A/c. No. 4272 with AIWC Extn. Counter of DDU Marg, New Delhi Branch. On 23 December 1991 a cheque book authorized to be issued in S.B. A/c. No. 4272 to one Sri Mohinder Kumar on the strength of a purported letter in violation of the laid down procedure of the bank. Thereafter, a total of Rs 1,07,000 was withdrawn from his account by utilizing five cheques out of the abovesaid cheque book, details which are given below:

Date	Cheque No.	Amount
26-12-91	460827	Rs 15,000
28-12-91	460823	Rs 15,000
31-12-91	460821	Rs 15,000
31-12-91	460822	Rs 14,000
31-12-91	460826	Rs 50,000

The accountholder has complained/disputed above said withdrawals as well as the issuance of the cheque book No. 460821 to 460830. The purported letter on the basis of which the abovesaid cheque book had been issued had also not been found on records. The handwriting expert has confirmed that the signatures appearing on the abovesaid cheque are not that of Mr. SV Deshpande, the accountholder and they are forged.

The cheque No. 460826 for Rs 50,000 was posted by you in the relative ledger on 31 December 1991 though there was a fictitious endorsement on the reverse of the cheque to give creditability to the transaction.

Handwriting expert has opined after examining your handwriting with that of the disputed instruments in question that the signatures of the account-holder appearing on the above said five cheques and the endorsement on the back of the cheque No. 46026 for Rs 50,000 is in your handwriting.

From the above, it is evident that you by misusing your official position, in collusion with someone else, got the above said cheque book issued in S.B. A/c. No. 4272, utilised the cheque leaves in question by forging the signature of the accountholder and got the same presented to encash the cheques fraudulently.

By your above said fraudulent acts you have caused damage to the property of the bank thereby committed a gross misconduct within the meaning of Chapter XI, regulation 3, clause (j) of Canara Bank Service Code.

Your above said acts are also prejudicial to the interests of the bank thereby you have committed a gross misconduct within the Meaning of Chapter XI, regulation 3, clause (j) of Canara Bank Service Code.

Your abovesaid acts are also prejudicial to the interests of the bank thereby you have committed a gross misconduct within the meaning of the Chapter XI, regulation 3, clause (m) of Canara Bank Service Code.

An appeal was preferred by the employee before the prescribed appellate authority who rejected the appeal. The employee challenged the findings culminating in his order of dismissal by filing a writ petition before the High Court.

> *The main plea which was advanced before the learned Single Judge was that the Enquiry Officer should not have rested his decision on the opinion of the Handwriting Expert. The entire case rested on suspicion and there was no material to connect him with the alleged misconduct. Learned Single Judge referring to the evidence recorded during the enquiry proceedings came to hold that the conclusions arrived at by the Enquiry Officer were erroneous and no credence should have been attached to the evidence of VK Sakhuja and his evidence is no evidence at all. It was also held that the charges framed by the Bank do not have sustainability in law. These observations came to be made by a learned Single Judge because of some adverse remarks made against VK Sakhuja in three cases. The conclusions of learned Single Judge in para 17 so far as relevant read as follows:*
>
> *The fact that the courts had made very strong stricture against the Handwriting Expert is not disputed. In my view, Mr. Sakhuja is not a person who is competent to speak about the handwriting or fingerprints. His evidence is no evidence at all. Consequently, the charge issued by the bank is not sustainable in law. The findings by the Inquiry Officer against the petitioner are not based on any evidence and, thus, the order passed by the disciplinary authority cannot be sustained, in law there is, no evidence against the petitioner. Thus, the order of the disciplinary authority is wholly illegal, and it cannot be sustained.*

In appeal, the Division Bench observed that the High Court in exercise of the power under Article 226 of the Constitution of India, 1950 (in short 'the Constitution') does not act as an appellate authority and, therefore, the learned Single Judge was not justified in interfering with the conclusions arrived at by the disciplinary authority. This judgment of the High Court is under challenge.

Learned counsel appearing for the appellant-employee submitted that there has been a denial of fair play. There is no material to connect the appellant with alleged forgery, which was the foundation for the disciplinary action. Report of the Handwriting Expert about whose credibility serious remarks were made has no evidentiary value, and he is not a competent witness and his report which forms the foundation for disciplinary action has to be ignored and if that is kept out of consideration, there is no other material on which the allegations of misconduct could be substantiated. It is pointed out that when investigation was done initially, a report was submitted by the Forensic Science Laboratory which did not find any material against the employee and others. The employee was also denied an adequate opportunity to submit his reply as regards the enquiry report. The charges related to two transactions. One was posting of the cheque and the other related to forgery. Report of the Handwriting Expert is full of inconsistencies and the conclusion about similarity in handwriting in the disputed document and the admitted signatures has been drawn erroneously. To prove his innocence the employee had requested the authorities to hand over the enquiry to the Central Bureau of Investigation. This request was made as the employee was convinced that the authorities were bent upon removing him from service for union activities. Further, request was made for being represented by an advocate which was turned down. The employee had requested for supply of certain documents which were not accepted to causing thereby prejudice.

Learned counsel for the respondents on the other hand submitted that the Division Bench rightly considered the scope and ambit of judicial review in the matter of disciplinary proceedings. The stand that the Handwriting Expert's report cannot be accepted without further corroboration is not the correct proposition in law. Denial of the representation by an advocate was also justified because the presenting officer was not an advocate or a person with a law background. The only area of dispute related to acceptability of the Handwriting Expert's report. The employee who claimed to be

a trade union activist is well-versed with various aspects relating to service jurisprudence, has cross-examined at length and quite effectively the management witnesses. Therefore, there is no substance in the plea that there was prejudice by refusal of permission to be represented by an advocate. It was further submitted that no argument was advanced before the High Court (either before learned Single Judge or the Division Bench) regarding prejudice. It is also pointed out that the employee himself held accepted that he committed careless mistakes but took the plea that there was no criminal intent. The authorities have analysed the job requirements of the post which the employee held and discussed at great length as to how the requisite care and caution were not exercised. A bare look at the endorsement on the back side of the cheque would have aroused suspicion. The plea that many transactions took place that day is clearly without substance because an employee of the bank is required to be vigilant and any abnormality should have been noticed. The customer was an advocate and he could not have misspelled the word 'signature' as appears on the reverse side of the cheque in question in the endorsement. There was an unusual endorsement and withdrawal of Rs 50,000 by a bearer cheque. The unusual features should have aroused suspicion. That being so, the authorities were justified in drawing adverse remarks. The report of the Handwriting Expert is clear and cogent and has clearly spelt out the areas of similarities in the disputed document and the admitted writings to highlight as to how employee was the author of forgery.

> ***To start with the approach of the learned Single Judge as regards evidence of VK Sakhuja is clearly erroneous. Even if there were adverse remarks (which we find related to 1958–59) that did not affect the credibility of his evidence to treat it as totally irrelevant and to be no evidence in the eye of law. What was required was a careful analysis of evidence, if it was brought to the notice of the authorities that his evidence has been doubted in the past. Nothing could be shown to us as to how the report in this particular case suffers from any infirmity. There is no finding recorded by learned Single Judge to that effect. On that score alone the Division Bench was justified in upsetting the learned Single Judge's decision.***

Sections 45 and 73 of the Indian Evidence Act, 1872 (in short 'The Evidence Act') deal with opinion of experts and comparison of signature, writing or seal with others admitted or proved. Section 45 itself provides that the opinions are relevant facts. It is a general rule that the opinion of witnesses possessing peculiar skill is admissible. There was no challenge to the expertise of VK Sakhuja. He deposed to have testified in about ten thousand cases relating to disputed documents. Though the employee highlighted certain adverse remarks, it cannot be lost sight that they were about four decades back. But we need not go into that aspect in detail as no infirmity in the report acted upon by the authority in the present case was noticed or could be pointed out.

It is to be noted that under sections 45 and 47 of the Evidence Act, the court has to take a view on the opinion of others, whereas under section 73 of the said Act, the court by its own comparison of writings can form its opinion. Evidence of the identity of handwriting is dealt with in three sections of the Evidence Act. They are sections 45, 47 and 73. Both under sections 45 and 47 the evidence is an opinion. In the former case it is by a scientific comparison and in the latter on the basis of familiarity resulting from frequent observations and experiences. In both the cases, the court is required to satisfy itself by such means as are open to conclude that the opinion may be acted upon. Irrespective of an opinion of the Handwriting Expert, the court can compare the admitted writing with disputed writing and come to its own independent conclusion. Such exercise of comparison is permissible under section 73 of the Evidence Act. Ordinarily, sections 45 and 73 are complementary to each other. Evidence of Handwriting Expert need not be invariably corroborated. It is for the court to decide whether to accept such an uncorroborated evidence or not. It is clear that even when experts' evidence is not there, court has power to compare the writings and decide the matter. [See *Murarilal v State of Madhya Pradesh,* AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396 : (1980) 2 SCR 249.]

In the instant case, the Enquiry Officer and the Disciplinary Authority took pains to carefully consider the Handwriting Expert's report and also looked at the documents to arrive at their own conclusions.

Great emphasis was laid on the Forensic Science Laboratory's report to say that the Handwriting Expert's report is not worthy of acceptance. We have looked at the report of the Forensic Science Laboratory. It only says that no definite opinion can be formed. That itself is an indication that a clean chit was not given as claimed by the employee.

It is fairly well-settled that the approach and objective in criminal proceedings and the disciplinary proceedings are altogether distinct and different. In the disciplinary proceedings the preliminary question is whether the employee is guilty of such conduct as would merit action against him whereas in criminal proceedings the question is whether the offences registered against him are established and if established what sentence should be imposed upon him. The standard of proof, the mode of enquiry and the rules governing the enquiry and trial are conceptually different.

See *State of Rajasthan v BK Meena,* AIR 1997 SC 13 : (1996) 6 SCC 417 : 1996 AIR SCW 4160 : 1996 (3) SCJ 582. In case of disciplinary enquiry, the technical rules of evidence have no application. The doctrine of "proof beyond doubt" has no application. The preponderance of probabilities and some material or record are necessary to arrive at the conclusion whether or not the delinquent has committed misconduct.

While exercising jurisdiction under Article 226 of the Constitution the High Court does not act as an appellate authority. Its jurisdiction is circumscribed by limits of judicial review to correct errors of law or procedural errors leading to manifest injustice or violation of principles of natural justice. Judicial review is not akin to adjudication of the case on merits as an Appellate Authority.

In *BC Chaturvedi v UOI,* AIR 1996 SC 484 : (1995) 6 SCC 749 : 1995 AIR SCW 4374 : JT 1995 (8) SC 65, the scope of judicial review was indicated by stating that review by the court is of decision-making process and where the findings of the disciplinary authority are based on some evidence, the court or the Tribunal cannot re-appreciate the evidence and substitute its own finding.

As observed in *RS Saini v State of Punjab,* AIR 1999 SC 3579 : (1999) 8 SCC 90 : 1999 AIR SCW 3587 : (1999) 5 Scale 427 in paras 16 and 17 the scope of interference is rather limited and has to be exercised within the circumscribed limits. It was noted as follows:

> Before adverting to the first contention of the appellant regarding want of material to establish the charge, and of non-application of mind, we will have to bear in mind the rule that the court while exercising writ jurisdiction will not reverse a finding of the enduring authority on the ground that the evidence adduced before it is insufficient. If there is some evidence to reasonably support the conclusion of the inquiring authority, it is not the function of the court to review the evidence and to arrive at its own independent finding. The inquiring authority is the sole judge of the fact so long as there is some legal evidence to substantiate the finding and the adequacy or reliability of the evidence is not a matter which can be permitted to be canvassed before the court in writ proceedings.

A narration of the charges and the reasons of the inquiring authority for accepting the charges, as seen from the records, shows that the inquiring has based its conclusions on materials available on record after considering the defence put forth by the appellant and these decisions, in our opinion, have taken in a reasonable manner and objectively. The conclusion arrived at by the inquiring authority cannot be termed as either being perverse or not based on any material nor is it a case where there has been any non-application of mind on the part of the inquiring authority. Likewise the High Court has looked into the material based on which

the enquiry officer has come to the conclusion, within the limited scope available to it under Article 226 of the Constitution and we do not find any fault with the finding of the High Court in this regard."

As noted above, the employee accepted that there was some lapse on his part, but he pleaded lack of criminal intent. A bank employee deals with public money. The nature of his work demands vigilance with the inbuilt requirement to act carefully. Any carelessness invites action.

As has been rightly submitted by learned counsel for the respondents-Bank, even to the naked eye the mistake in spelling of "signature" are visible and should not have escaped the eyes of a bank employee who is supposed to be trained and equipped to notice the similarities highlighted by the Handwriting expert in the disputed document and the admitted signatures of the employee to show how the similarly is visible and even any layman can notice the similarity. These were a factual conclusion.

Considering the limited scope of judicial review, the Division Bench was right in upholding the order of dismissal by setting aside the learned Single Judge's order by which interference was made with it. We find no reason to differ from the conclusion of the Division Bench. The appeal is without merit and is dismissed accordingly.

10.26 ADDITIONAL CASE LAW

10.26.1 Expert Evidence not Essential[38]

1. Marmik's statement that the appellant had written the endorsement on the postal receipt has been accepted by the High Court. It is not necessary to examine a handwriting expert in every case of disputed writing. The investigating officer stated that he did not send the specimen writing of the appellant for comparison with the endorsement on the postal receipt as he could not secure admitted writings of the appellant though he tried his best to obtain his admitted handwritings. He was not further questioned to explain why he considered it necessary to have admitted writings of the appellant in order to obtain the opinion of the handwriting expert about the disputed writing when specimen writings of the appellant were available. The explanation of the investigating officer seems to have been on account of practice. It appears from his statement that he sent certain questioned documents along with the admitted handwritings and specimen handwritings, signatures and initials of accused Nos. 1 and 2 to the government examiner of questioned documents. The practice may be sound or not but the *bona fides* of the conduct of the investigating officer cannot be questioned. The High Court, however, further considered that the material provided by the writing on the acknowledgement receipt was very scanty and the investigating officer might have felt that the subsequent handwriting would be feigned or disguised and that any comparison with the same would be deceptive. Such considerations might have been in the mind of the investigating officer but he had not stated them to be his reasons for not obtaining the opinion of the handwriting expert. The High Court cannot be said to have been in error in taking these further reasons into consideration and holding that no adverse inference can be drawn against the prosecution from the fact that the opinion of the handwriting expert has not been obtained with respect to the endorsement on the acknowledgement receipt.[1]

38. *Srichand K Khetwani v State of Maharashtra*, AIR 1967 SC 450 : (1967) 1 SCWR 896 : 1967 Cr LJ 414 (SC).

10.26.2 Court as Expert[39]

This statement is not factually correct also as the trial court had itself compared these writings and signatures with certain other writings which had been proved to be of the respondent. A court is competent to compare the disputed writing of a person with others which are admitted or proved to be his writing. It may not be safe for a court to record a finding about a person's writing in a certain document merely on the basis of the comparison, but a court can itself compare the writings in order to appreciate properly the other evidence produced before it in that regard. The opinion of a handwriting expert is also relevant in view of section 45 of the Evidence Act, but that too is not conclusive. It has also been held that the sole evidence of a handwriting expert is not normally sufficient for recording a definite finding about the writing being of a certain person's or not. It follows that it is not essential that the handwriting expert must be examined in a case to prove or disprove the disputed writing. It was, therefore, not right for the learned judge to consider it unsafe to rely upon the evidence of the complainant in a case like this, *i.e.*, in a case in which no handwriting expert had been examined in support of his statement.[40]

10.26.3 Expert Evidence Essential[41]

1. A comparison of the signature of the first defendant in Ex-A-1 with those found in Exs. B-4 to B-10 brings out the clear differences between the two. While the admitted signatures are in a free and flowing hand, the disputed one appears to be a laboured and constrained one. D.W. 2 says that in his signature ordinarily there will be spacing between the first two letters and the third letter and that the final two letters are written one over the other.

In the admitted signature, the first two letters are written over one another and there is spacing between the 2nd letter and the 3rd letter whereas it is not so in the case of the disputed signature. In this case, we have not had the advantage of a handwriting expert scrutinizing the signatures and giving his opinion on the genuineness or otherwise of the disputed signature. This is certainly one of those cases where expert evidence would have been of great use.

But for one reason or other that was not done in the court below. The learned counsel for the appellant suggests that the document may now be sent to an expert but we think the request is rather too late for the suit is of the year 1950 and six years have passed by. The appellant also filed an application for admission of other documents containing the first defendant's signatures for comparison. It is alleged in the affidavit filed in support of the petition that said documents were sent to the High Court in Appeal No. 812 of 1948, and, after the appeal was disposed of, they had been returned to the District Court, Anantapur and they were still there.

But that appeal was disposed of in February, 1951, whereas the suit out of which this appeal arises, was dismissed on 25 February 1952 and the plaintiff had every opportunity to file the documents in the District Court if he had intended to use them for the purpose of

39. *State of Gujarat v Vinaya Chandra Chhota Lal Pathi*, AIR 1967 SC 778 : (1967) 1 SCWR 391 : 1967 Cr LJ 668 (SC). **Also see**: *Basawarajaswami (Re)*, AIR 1967 Mys 210 : (1967) 1 Mys LJ 548 : 1967 Cr LJ 1536 (Mys); *Ranjit Sinha v State of Bihar*, (1963) 2 Cr LJ 36 (Pat).
40. *State of Gujarat v Vinaya Chandra Chhota Lal Pathi,* AIR 1967 SC 778 : (1967) 1 SCWR 391 : 1967 Cr LJ 668 (SC). Also see *Re Basawarajaswami*, AIR 1967 Mys 210 : (1967) 1 Mys LJ 548 : 1967 Cr LJ 1536 (Mys); *Ranjit Sinha v State of Bihar,* (1963) 2 Cr LJ 36 (Pat).
41. *Koppala Venkataswami v Satrasala Lakshminarayana Chetti*, AIR 1959 AP 204 : ILR 1957 AP 399 : 1959 Cr LJ 428 (AP).

comparison. There are no grounds for admitting the fresh document sought to be filed in this case.

No doubt, a comparison of the signatures without the help of an expert may not afford a conclusive test in the case of expert forgeries. But, in this case, the disputed signature appears to belong to a class different from the group of admitted signatures. It is not as if the admitted signatures were scribbled on some unimportant papers but they were all affixed to promissory notes wherein the first defendant was undertaking a liability.[42]

10.26.4 Court no Expert[43]

In view of the respective contentions of the parties the only question that falls for determination in this appeal is whether the learned Magistrate was justified in acquitting the respondents of the charge under section 63 of the Copyright Act, for absence of any expert opinion to prove that the offending books of the respondents were reproduction of the book printed and published by the *de facto* complainant. It appears from the impugned judgment that in insisting upon an expert opinion in deciding such a case the learned Magistrate relied upon a Division Bench judgment of this court in the case of *Sita Nath Basak v Mohini Mohan Singh*, AIR 1924 Cal 595. It is interesting to find that the case arose out of the copyright, which is the subject-matter of this appeal. It was held therein that the court should be reluctant to sit as an expert to decide the question of infringement of copyright and the proper course, in ordinary circumstances was to get the opinion of experts. On a careful perusal of the judgment in that case I find that the above view was expressed primarily on the ground that the court would have to take great pains and would have to waste its valuable time to ascertain how far the piracy extended and it was desirable therefore to seek opinion of expert to compare the works and to ascertain the details to avoid excessive expenditure of time and labour. The court also pointed out that such a course was also necessary as the court might not be conversant with the alphabets of the book.

In view of the above judgment, this court, in ordinary circumstances would have referred to the matter to the learned Magistrate to get the evidence of experts to ascertain whether the offence under the Copyright Act, was committed or not for the learned Magistrate was not justified in recording an order of acquittal for absence of any expert opinion. When the books were before him the court could have on its own motion, examined such experts for ends of justice. But then considering the fact that the offences were allegedly committed in the year 1972 and the case was instituted in 1973, such a direction would cause further delay. That apart considering the contents of the book I do not think it necessary to get the evidence of experts particularly when this court is acquainted with the alphabets. As pointed out in the judgment of *Sita Nath Basak* (supra) in ordinary circumstances expert opinion is necessary particularly when the contents of the book are such that the court, being not an expert cannot decide whether there is piracy or not. Considering all these facts and aspects; I proceed to decide whether the books printed and published by the respondents can be said to have infringed the copyright of the book owned by the *de facto* complainant. Before doing so it will be necessary to state the nature and contents of the books.[44]

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42. *Koppala Venkataswami v Satrasala Lakshminarayana Chetti,* AIR 1959 AP 204 : 1957 ILR AP 399 : 1959 Cr LJ 428 (AP).
43. *State of West Bengal v Nitya Gopal Basak*, 1985 Arbi LR 137 : 1985 Cr LJ 202 (Cal).
44. *State of West Bengal v Nitya Gopal Basak,* 1985 Arbi LR 137 : 1985 Cr LJ 202 (Cal).

10.26.5 Evidence Admissible[45]

In our view, the legal position enunciated in *Fakhruddin's* case[46] cannot be said to be inconsistent with the ratio of any one of the earlier decisions to which reference has been made therein. Now it is no doubt true that the opinion of a handwriting expert given in evidence is no less fallible than any other expert opinion adduced in evidence with the result that such evidence has to be received with great caution. But this opinion evidence, which is relevant, may be worthy of acceptance if there is internal or external evidence relating to the document in question supporting the view expressed by the expert. If after comparison of the disputed and the admitted writings by the court itself, when the presiding officer is familiar with that language it is considered safe to accept the opinion of the expert then the conclusion so arrived at cannot be assailed on special leave on the mere ground that comparison of handwriting is generally considered as hazardous and inconclusive and that the opinion of the handwriting expert has to be received with considerable caution. The question in each case falls for determination on the appreciation of evidence and unless some serious infirmity or grave failure of justice is shown this court would normally refrain from reappraising the matter on appeal by special leave. The trial court in this case agreeing with the principle of law enunciated by this court compared the relevant documents and arrived at the conclusion that they have all been written in one hand. The learned second temporary Session Judge on appeal after referring to the comparison of the disputed and specimen writings by the trial magistrate himself compared those writings with the help of the expert's opinion and his report and came to a definite conclusion "that the disputed handwritings tally with the specimen handwriting". In the High Court also the learned single judge, after referring to the decision in *Fakhruddin* case (supra), observed as follows:

> *I have myself made a comparison of the specimen writing of the applicant with the writing contained in the two letters. I have not the least doubt that the writing in the post-card and the writing in the admitted writing of the applicant are the same. Thus, I have no reason to differ from the finding recorded by the courts below.*

No serious attempt was made on behalf of the appellant to find fault with the approach of the three courts below. There is, therefore, no ground made out for interference by this court with the appellant's conviction. Unfortunately, the record is not before us otherwise we would have also tried to examine for ourselves the disputed and the specimen handwritings. However, in view of the concurrent decisions of the three courts below we did not consider it necessary to adjourn the hearing of this case to have the documents before us for our examination.[47]

10.26.6 Court No Expert[48]

Mr. Kohli said that these cases establish that the evidence of the handwriting expert is worthless and the court cannot compare the writing for itself and the only possible evidence should have been of one who either saw Fakhruddin write or was familiar with the writing. We had sent for

45. *Ram Narain v State of Uttar Pradesh*, AIR 1973 SC 2290 : (1973) 2 SCC 86 : 1973 Cr LJ 1187 (SC). **Also see:** *Bhagwan Kaur v Shri Maharaj Krishan Sharma*, AIR 1973 SC 1346 : (1973) 4 SCC 46 : 1973 Cr LJ 1143 ; *State of Himachal Pradesh v Kishan Dayal*, AIR 1952 HP 36 : 1952 Cr LJ 1128 (HP) ; *Channu Lal v Rex*, AIR 1949 All 692 : 1950 Cr LJ 199 ; *Ram Bharosey v Emperor*, AIR 1936 All 269 : 37 Cr LJ 523.
46. AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.
47. *Ram Narain v State of Uttar Pradesh,* AIR 1973 SC 2290 : (1973) 2 SCC 86 : 1973 Cr LJ 1187 (SC). Also see *Bhagwan Kaur v Shri Maharaj Krishan Sharma,* AIR 1973 SC 1346 : (1973) 4 SCC 46 : 1973 Cr LJ 1143; *State of Himachal Pradesh v Kishan Dayal,* AIR 1952 HP 36 : 1952 Cr LJ 1128 (HP); *Channu Lal v R,* AIR 1949 All 692 : 1950 Cr LJ 199; *Ram Bharosey v Emperor,* AIR 1936 All 269 : 37 Cr LJ 523.
48. *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.

the writings which are disputed and the writings with which they were compared with a view to observe for ourselves the similarities and differences between the two and to verify whether the conclusions of the handwriting expert were proper or not. Mr. Kohli contended that this was not open to us. We do not agree.

Evidence of the identity of handwriting receives treatment in three sections of the Indian Evidence Act. They are sections 45, 47 and 73. Handwriting may be proved on the admission of the writer or by the evidence of some witnesses in whose presence he wrote. This is direct evidence and if it is available the evidence of any other kind is rendered unnecessary. The Evidence Act also makes relevant the opinion of a handwriting expert (section 45) or of one who is said to have familiarity with particular writing. Thus, besides direct evidence which is of course the best method of proof, the law makes relevant two other modes. A writing may be proved to be in the handwriting of a particular individual by the evidence of a person familiar with the handwriting of that individual or by the testimony of an expert competent to do the comparison of handwritings on a scientific basis. A third method (section 73) is comparison by the court with writing made in the presence of the court or admitted or proved to be the writing of the person.

Both under section 45 and section 47 the evidence is an opinion, in the former by a scientific comparison and in the latter on the basis of familiarity resulting from frequent observations and experience. In either case the court must satisfy itself by such means as are open that the opinion may be acted upon. One such means open to the court is to apply its own observation to the admitted or proved writings and to compare them with the disputed one, not to become an handwriting expert but to verify the premises of the expert in the one case and to appraise the value of the opinion in the other case. This comparison depends on an analysis of the characteristics in the admitted or proved writings and the finding of the same characteristics in large measure in the disputed writing. In this way the opinion of the deponent, whether expert or other, is subjected to scrutiny. Where an expert's opinion is given, the court must see for itself and with the assistance of the expert come to its own conclusion whether it can safely be held that the two writings are by the same person. This is not to say that the court must play the role of an expert but to say that the court may accept the fact proved only when it has satisfied itself on its own observation that it is safe to accept the opinion whether of the expert or other witnesses.

Therefore, to satisfy ourselves whether the testimony of the handwriting expert is acceptable or not, we, sent for the record and compared the disputed writings with some comparable material. There were two such writings which were claimed as standard. One was a register maintained at the office of the Association in which there was a signature in three places in Hindi which purported to be that of Fakhruddin (Ex. P-56). The other was a writing which Fakhruddin made to the dictation of the police officer in jail (Ex. P-61). These were of course not admitted by Fakhruddin and the question had to be first decided which of the two or both could be said to be approved standard material. Mr. Kohli urged that Ex. P-56 could not be so treated as there was no proof that the signatures were made by Fakhruddin. In this submission Mr. Kohli is right. The evidence of Tahir Ali, P.W. 14 which has been relied upon is not definite on this point. He does not say that the signatures were of Fakhruddin who was the accused in the case. He only says that the person whose signatures were made in the register, signed it and this leaves the matter at large. There is, however, proof that the other writing was made by Fakhruddin, the appellant. The sub-inspector, P.W. 33 took the precaution of having two witnesses P.W. Nos. 16 and 27. Of these P.W. 16 did not identify the appellant as the writer but the other P.W. 27 did. Exhibit P-61, therefore, furnishes the necessary comparative material.

Mr. Kohli said that the expert took both Exs. P-56 and P-61 into account to reach his conclusion that the disputed writing was that of the appellant and he might have been persuaded to this view on the strength of Ex. P-56. This is not a correct reading of the evidence. The expert said that Exs. P-56 and P-61 and the disputed writings were all by the same person as they possessed the same individual characteristics. In other words, he proved that all these writings agreed in characteristic features. He proved that Exs. P-56 and P-61 were by the same writer but as we need not go to Ex. P-56 we may leave it out altogether and the conclusion of the expert that Ex. P-61 and the disputed material were written by the same person thus remains unimpaired.

We sent for these writings and compared them to satisfy ourselves about the accuracy of the expert's observations. Exhibit P-61 and the disputed writings on the applications are so clearly written by the same person that one hardly needs expert guidance. Numerous idiosyncrasies in one are faithfully reproduced in the other and leave no manner of doubt as to the authorship of the applications. They were written by the appellant. As the applications are ostensibly by different persons the conclusion is inescapable that Fakhruddin was making applications in diverse names and collecting iron sheets in this manner. Once the offence of forgery is established the proof of the other offence is clear. Fakhruddin's conviction for the offences other than conspiracy was, therefore, soundly grounded.[49]

10.26.7 Court's Scrutiny supports Expert Evidence[50]

So far as the appellant Ram Chandra is concerned the circumstantial evidence against him in respect of both the offences is clear. On the finding that the various ransom letters are in his handwriting and on the finding that a very large number of the noted currency notes which formed the ransom money was traced to his possession, there can be no doubt as to his conviction under section 386, Penal Code. It may be that normally it is not safe to treat expert evidence as to handwriting as sufficient basis for conviction. But in this case the authorship of the letters has been held by the courts below to be that of appellant Ram Chandra, on various items of external and internal evidence already noticed above in addition to the opinion of the expert. As regards the charge against him under section 364, Penal Code, for kidnapping, though there is no direct evidence, the various ransom letters categorically state that the missing boy is in the custody or control of the writer. Therefore, it is asserted therein that on payment of the ransom money, the boy will be restored at a particular time and place. We find it hard to believe that this can be mere pretence in order to strike terror in the mind of the father of the boy and to obtain money. It is to be noticed that the ransom letters started from the day next after the disappearance of the boy and they continued pouring in, right up to 4th July, a period of over three weeks. It appears to us to be extremely improbable that a person can keep up the pretence for so long if he had not the absolute confidence that there was no chance of the boy returning until the time which he had to take for bringing about payment of the ransom. The tone of these letters justifies one of two inferences, *viz*., either the boy has been already murdered as the confession suggests, or the boy, having been kidnapped is kept in effective custody so as not to be able to escape. We have, for reasons already given, felt it unsafe to convict the appellant Ram Chandra of the offence of murder. But there is absolutely no reason why his very admissions in the various letters of which he has been found to be the author, should not be treated as clear evidence against him that he has obtained the custody of the boy by kidnapping. It is true that the boy has not, in fact, been restored as promised in the various letters. But this by itself is no indication that the boy had not been kidnapped by persons of whom the writer of these letters is one. It may be recalled that though the boy was not restored

49. *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.
50. *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559.
Also see: *Maliah v State of Mysore*, 1956 Cr LJ 253 (Mys).

on the 5th July, as promised, there was a further letter from the same writer dated the 5th July promising to restore the boy later on. This promise may not have fructified since before it has received the appellants were arrested. We are of the opinion that the circumstances lead to the conclusion that the appellant, Ram Chandra is guilty of the offence under sections 364 and 386 of the Indian Penal Code. It may also be mentioned that though we have considered it unsafe to act upon the confession as basis for the conviction in respect of murder, there is no reason why the confession insofar as it relates to the two offences of kidnapping and extortion should not be taken into consideration as against this accused to lend assurance to the conclusion we have reached against him insofar as these offences are concerned based on circumstantial evidence.

10.26.8 Evidence Reliable[51]

Shri Gopaiji Misra, Assistant Director-cum-Assistant Chemical Examiner, Forensic Science Laboratory, Chandigarh, P.W. 10, examined this Haryana Lottery Ticket in dispute Exhibit P-1 bearing No. B. 0623368 and also its number marked Q/l under stereo microscope in oblique reflected and transmitted light. On thorough examination he observed as follows:

1. First two digits from left to right, *i.e.*, 0 and 6 have not been tampered with except inking around these two digits.
2. From third to last digit (from left to right), *i.e.,* 2, 3, 3, 6, 8 are on small square pieces of papers bearing digits 2, 3, 3, 6 and 8 have been pasted separately.
3. The gaps between these square pieces of papers are clear at the places (a) in the horizontal part below the digits from 2 to 8, (b) in the vertical upper part between the digits 6 and 2, (c) in the vertical upper part between the digits 2 and 3, (d) in the upper vertical part between the digits 6 and 8, (c) in the middle and lower part of the right side of the digit 8.
4. The overlapping of these small pieces of papers is clear at places (a) in the lower vertical part between the digits 2 and 3, (b) in the lower vertical part between the digits 6 and 8.
5. The digits making the number of the ticket are not in proper alignment.

He gave the opinion that the digits from third to last (2, 3, 3, 6 and 8) have been transplanted in the gap made by cutting the original digits on the ticket and that the two digits 0 and 6 are original digits as no patch work could be observed. The inking around all the digits had been done to hide the tampering. He prepared the photographs Exhibits P.H., P.H./l and P.H./2 of the full ticket and the number bearing portion in reflected and transmitted ordinary light. His report is Exhibit P.G., which is signed by him. This witness was cross-examined by the counsel for the accused but nothing could be elicited from him to shake his testimony. He is M.Sc. and Ph.D. in Chemistry and has undergone practical training in Forensic Science Laboratory, Calcutta and Chandigarh and has done original research work, he is a Government servant and is a disinterested person. There is nothing on the file to shake his testimony and see no reason to disbelieve his evidence. From the positive statement of this witness, it is established beyond any reasonable doubt that the digits 2, 3, 3, 6 and 8 of the number of this winning ticket Ex. P-1, in dispute have been replaced by cutting the original digits on the ticket and the number of the ticket and also the digits of this number have been inked with a view to hide the tampering of the number of the digits.[52]

51. *Jai Singh v State*, Criminal Appeal No, 1178 of 1972 (P&H HC).
52. *Jai Singh* v *State*, Criminal Appeal No. 1178 of 1972 (P&H HC).

10.26.9 Court not super Expert[53]

But to prove the charge in the present case, the aforesaid conclusion is not of any material consequence, though the learned trial Judge has totally been swayed away because of the aforesaid conclusion reached by him earlier. The sole question for consideration is as to who had filled in the application forms for withdrawal (Exts. 10 and 11) and signed the same. Was it the accused, or the depositor (P.W. 1), or anybody else? If the conclusion from the evidence is that it was the accused who had filled in the forms as well as signed the same, then the accused must be held to be liable for the offence alleged against him. The accused has admitted that he has entered in Exts. 10 and 11 the pass order and further he has made the corresponding entries in the list of the transaction is Exts. 23 and 24, as well as the logbook under Exts. 25 and 26, and so also the cash books (Exts. 27 and 28). In all these documents corresponding entries as to the withdrawals contained in Exts. 10 and 11 have been made by the accused. P.W. 3 in his evidence states that Exts. 10 and 11 did not pass through him and on account of pressure of work sometimes, the postmaster himself was also doing the job of P.W. 3. Even the learned trial Judge himself has believed this part of the evidence of P.W. 3 and has come to the conclusion that due to heavy pressure of work in the seat of the counter clerk (P.W. 3), the accused as postmaster might have personally dealt with the withdrawal applications (Exts. 10 and 11). In the aforesaid context, one will have to examine the evidence of the Handwriting Expert (P.W. 9), who has categorically opined that it is the accused who has filled in the forms in Exts. 10 and 11 and also made the signatures purporting to be those of the depositor, Artratran Behera. After comparing the admitted writings of the accused with the disputed ones, the Handwriting Expert has categorically opined that the writings marked as Q-3, Q-15 and Q-21 are in the handwriting of the accused. Q-3 is the portion contained in red-mark which has been filled up by writing, Q-15 is the filling up of the form on the backside which is nomenclatured as "warrant of payment". Q-21 is the blank portion contained in the same form which has been filled up indicating receipt of payment. The Expert has further opined that Q-9 which is the purported signature of the depositor on the application for withdrawal and Q-27 which is the purported signature of the said depositor in token of receipt of payment on Ext. 10 are not the signatures of the depositor (P.W. 1) and that he has opined by comparing the same with the admitted writings of the depositor in Exts. 3 to 9. Similarly, the Expert has also opined in respect of the writings on Ext. 11. The learned trial judge has lightly brushed aside the aforesaid evidence of the Expert on the ground that there is no corroboration to the said evidence and in my opinion, he has committed gross error in rejecting the evidence of the Expert. Apart from the evidence of the expert (P.W. 9), P.Ws. 3 and 7 who are the co-employees of the post-office also state that the writings on Exts. 10 and 11 were those of the accused.

In the case of *Murarilal v State of Madhya Pradesh*, AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396, it has been held:

> *We are firmly of the opinion that there is no rule of law, nor any rule of prudence which has crystallised into a rule of law, that opinion evidence of a handwriting expert must never be acted upon, unless substantially corroborated. But, having due regard to the imperfect nature of the science of identification of handwriting, the approach, as we indicated earlier, should be one of caution. Reasons for the opinion must be carefully probed and examined. All other relevant evidence must be considered. In appropriate cases, corroboration may be sought. In cases where the reasons for the opinion are convincing and there is no reliable evidence throwing a doubt, the uncorroborated testimony of an handwriting expert may be accepted. There cannot be any inflexible rule on a matter which, in the ultimate analysis, is no more than a question of testimonial weight …*

53. *State of Orissa v Sapneswar Thappa*, 1987 Cr LJ 612.

Applying the aforesaid test in the present case to the evidence of P.W. 9, I do not find any reliable evidence which throws a doubt on the expert's evidence. If the reasons for the opinion of the Expert are probed, nothing has been elicited in the cross-examination of P.W. 9 to throw any doubt on his testimony. That apart, I find sufficient corroboration in the present case from the evidence of P.Ws. 3 and 7 and again from the statement of the accused himself. This being the evidence, I hold that the prosecution has been able to satisfactorily prove that it is the accused who has filled up the withdrawal application (Exts. 10 and 11) in the name of P.W. 1 and has also forged his signatures thereon. Thus, the charges under sections 467 and 471 of the IPC have been fully established against the accused.[54]

10.26.10 Forgery/Tear identified Fraud[55]

It was the case of the respondent that Voucher Ex. P.W. 14/1 was a forged document and had been surreptitiously replaced for the genuine voucher in his return of expenses. The trial court has carefully examined this aspect of the controversy and has dealt with it adequately. The voucher was examined in the Central Forensic Science Laboratory, Chandigarh, and has given adequate reasons for the opinion that there was sufficient evidence to conclude that the voucher Ex. P.W. 14/1, its perforated part left in the cash memo book and the counterfoil did not originate from the cash book Ex. P.W. 14/2 from which, it was stated by Dina Nath P.W. 14, to have originated. The witness categorically stated that the voucher Ex. P.W. 14/1 had been substituted later on. The trial court rightly came to the conclusion that this was really so, and that the statement of Dina Nath about the printing of the offending poster Ex. P.W. 14/4 at the instance of the respondent is unbelievable.[2]

10.26.11 Appraisal[56]

1. The main criticism of the learned counsel for the appellant against the testimony of Mr. N Das Gupta is, that his opinion has been contradicted by the expert examined by the defence and that where the charge against the accused is one of forging a writing, as a rule it is imprudent to convict him solely on the basis of the expert testimony.

I have no quarrel with this proposition. It is merely a rule of caution and not an absolute rule of law. There is nothing in law to prevent the court from recording a conviction on expert evidence alone. The reason is that the identification of handwriting is an imperfect science. Experts often give dogmatic opinions unsupported by reasons. The value of the expert evidence, however, varies with the circumstances of each case and the reasons given by him in support of his opinion. Its value is to be judged with the same yardstick with which the evidence of any other witness is appraised. It is to be seen how far it fits in with the surrounding circumstances and the natural probabilities of the case. If in a given case the evidence of the expert is materially corroborated and confirmed by the other evidence, there is nothing in law to debar the court from recording a conviction of the accused on the basis of such expert testimony.

In the instant case, the evidence of Mr. N Das Gupta finds material corroboration from the circumstantial evidence brought on the record.

After going through the evidence of the experts, I am clearly of the view that the evidence of Mr. AS Kapur, A. 37/D.W. 17, is not reliable while that of Mr. N. Das Gupta, P.W. 120, is creditworthy. *Firstly*, Mr. Kapur did not examine all the original writings which are in question. He only saw photographs of some of them, supplied to him by the accused. Even the exa-

54. *State of Orissa v Sapneswar Thappa*, 1987 Cr LJ 612.
55. *Shiv Chand v Ujagar Singh,* (1980) 2 SCC 1977.
56. *Manmohan Singh Johal v State of Punjab*, 1969 Cr LJ 932 : AIR 1969 Punj 225 : ILR (1969) 2 Punj 173.

mination of these originals made by him in court was only for about one hour. Furthermore, the surrounding circumstances and the other overwhelming evidence brought on record by the prosecution clothe the opinion of Mr. N Dass Gupta with a high degree of probability. Particularly, the set habit of the writer, as revealed by the specimen as well as the questioned entries in the passports in committing the same spelling mistakes such as writing the word "Belgium" as "Belguim", goes to show that at least those entries on the passports were written by Mr. Johal.[57]

10.26.12 Corroboration of Handwriting Expert[58]

The next category of evidence in this case consists of the evidence of the expert, Mr. Gregory (P.W. 286), with regard to the disputed documents. It has been contended that the opinion of the handwriting expert is a very unsafe basis for conviction. A number of authorities have been cited for this well-established proposition. I may mention, in particular, the following:

> *Ishwari Prasad Misra v Mohammad Isa*, AIR 1963 SC 1728 : (1963) 2 SCR 722 : 1963 BLJR 226 ; *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559 ; *Kameshwar Nath v State,* 1957 All WR (HC) 842 : 1957 Cr LJ 276 (All) ; *Sudhindra Nath Dutt v The King,* AIR 1952 Cal 422 ; *Ambal Bagyam v Ramayya Padayachi,* AIR 1955 Mad 88 : 1954 Mad WN 757(2).

In *Ishwari Prasad Misra v Mohammad Isa*, AIR 1963 SC 1728 : (1963) 2 SCR 722 : 1963 BLJR 226, Gajendragadkar, J, (as he then was) observed: "Evidence given by experts of handwriting can never be conclusive, because it is after all opinion evidence". It appears necessary for me to point out that opinion evidence cannot, as a general rule, be considered infallible.

In *Ram Chandra's* case[59], their lordships of the Supreme Court did not lay down a general rule of prudence with regard to expert evidence in stronger terms than these, "it may be that normally it is not safe to treat expert evidence as to handwriting as sufficient basis for conviction". And, after making this observation, their lordships accepted the expert evidence as it was corroborated by other evidence including the internal evidence furnished by the writing on the document itself.

Even in *Kameshwar Nath's* case,[60] in which Asthana, J. of this court, cited a passage from Sircar's Law of Evidence pointing out the deceptibility of the evidence of handwriting experts, on which strong reliance is placed by the appellants. It was pointed out, relying on *Kalicharan Mukherji v King Empero*[61] that there might be such characteristic peculiarities, of a writer as to lead to an irresistible conclusion about his identity from a writing. Mr. PC Chaturvedi drew my attention to an unreported decision of this court in *Kameshwar v State,* (Criminal Appeal Nos*,* 1672 : 1675) and 2132 of 1958, dated 10 February 1960 (All), in which the accused is apparently the same individual as Kameshwar Nath of the 1957 case. In this case, where facts were certainly very exceptional and remarkable there was found to be what was described as a 'twin-like resemblance" between the disputed writings alleged to be of the accused and the indisputably proved writings of another individual who had nothing to do with the disputed writings so that the expert and also other witness, who were very familiar with the writing

57. *Manmohan Singh Johal v State of Punjab*, AIR 1969 P&H 225 : 1969 Cr LJ 932 : (1969) ILR 2 P&H 173.
58. *Devi Prasad v State of Uttar Pradesh*, AIR 1967 All 64 : 1967 Cr LJ 134 (All). Also see *Ravjappa v Nilakanta*, AIR 1962 Mys 53 : ILR 1960 Mys 1206 : (1962) 1 Cr LJ 441 (Mys); *State of Madhya Pradesh v Dhannelal*, 1961 (2) Cr LJ 233 (MP); *Amir Chand v Lok Nath*, AIR 1951 P&H 90(1) : AIR 1952 J&K 26 : 1952 Cr LJ 1230 (Nag) ; *Sripada Sinai Duclo v State of Goa, Daman and Deo*, 1976 Cr LJ 145.
59. AIR 1957 SC 381 : 1957 Cr LJ 559.
60. *Kameshwar Nath v State,* 1957 All WR (HC) 842 : 1957 Cr LJ 276 (All).
61. 6 All LJ 184.

of the accused, were completely misled and were compelled to admit their mistakes when it was pointed out. This case illustrates the danger inherent in evidence relating to the identity of an accused person from similarities in writings only. I am, however, unable to hold that the evidence as to the identity of an accused person, from close resemblance between his admitted handwriting and the disputed handwriting, is even less reliable than evidence as to the identity based upon personal impressions of previously unknown individuals, alleged to have been seen in all kinds of lights in dacoity cases, which courts in this country do accept and act upon. The authorities cited before me only indicate the need for care and caution in judging and utilising the testimony of handwriting experts. Apart from the liability to err to which opinion evidence and evidence as to identity in general are specially exposed, the technical terminology of the handwriting expert (his "jargon" as the anti-experts would like to call it) enables the expert to conceal errors and even dishonesty to a degree which an untrained witness cannot attain.

No useful purpose will be served by discussing the fallibility and deceptibility of expert opinion evidence and of evidence relating to identity or the abstract general principles about such evidence which are well-established. An appellate court has to examine whether the trial court has correctly understood the general principles and then rightly applied them in assessing the worth of the particular opinion evidence upon the data in a given case. Reliable criteria have been scientifically formulated for judging the worth of the evidence of handwriting experts. The trial court has rightly relied upon *Jitendranath Gupta v Emperor,* AIR 1937 Cal 99 : 38 Cr LJ 818 (SB) and has pointed out that the evidence of an expert has to be tested with care and caution and has set out the considerations which the learned judge has applied in judging the worth of the expert's evidence in this case.

A great deal of emphasis was placed upon the brevity of the reasons given by the expert, Mr. Gregory, in his reports on the disputed documents. Quotations from a work of Mr. Osborn, the well-known authority on handwriting, were made to demonstrate the weight to be attached to the reasons given for an opinion by an expert. There is no doubt that the worth of an opinion can be tested by the reasons given in support of that opinion and not by the bare conclusions of the expert. Nevertheless, the trial Court was, in my opinion, quite justified in pointing out that the opinion can be stated by the expert both by means of a report and by means of the statement in the witness box which must be there in addition. Moreover, as the unsoundness of the expert's opinion about some writing can be demonstrated by means of his cross-examination, the brevity of his reports is not sufficient to destroy the value of his evidence. Even if the reports given by the expert are very brief in this case, in view of the great number of documents alleged to bear the writings of the accused persons, the expert has supplemented his reasons by his statement in court, and he has been subjected to quite stringent and searching and expert cross-examination. It may be observed that the appellants did not produce an expert in reply to the evidence of the expert produced by the prosecution. In my opinion, the brevity of the initial statements made by the expert in the form of his reports upon the disputed handwritings of the accused is not sufficient to justify the elimination of the expert's testimony as worthless in this case.

It was argued that Mr. Gregory (P.W. 286) was not really a handwriting expert at all inasmuch as he did not hold any qualification, such as a degree or a diploma possessed by a qualified medical or legal practitioner. This objection overlooks what was pointed out by Dr. WR Harrison, Director, Home Office Forensic Science Laboratory of Britain, in a recent book entitled *Suspect Documents:*

> *The demand for specialists in the examination of documents is so small that comparatively few qualified men are ever likely to be wholly engaged in this work. No university college of*

> *any standing either in Great Britain or America offers a course of study leading to a degree and if such a course were contemplated, it would be a difficult matter to provide either teachers or anything like full employment for any substantial number of students when qualified.*

Mr. Gregory has deposed that he is a handwriting expert, with a standing of 32 years at the time when he gave evidence in 1961, and that he had given evidence in more than 2,500 cases all over India. He also stated that he held certificates of competency from leading handwriting experts, including one from Dr. Locard, Ex-Director of the French Police Laboratory and that, in 1948 he went to England to study the latest developments in his subject at the laboratory of the world famous Scotland Yard. He also stated that he had been an expert placed on the approved list of the Oudh Chief Court and also a consulting expert of the Criminal Investigation Department of Uttar Pradesh. He has also written a book on the subject. The above-mentioned credentials and qualifications of Mr. Gregory were, at any rate, not questioned in the course of his cross-examination. However, it is not the apparent qualifications of a handwriting expert which ought to determine the value of the evidence given by him, but the soundness of the reasons advanced by him in support of the particular opinion expressed by him. These reasons are always open to scrutiny by a court of law, and their soundness can be tested by examining the disputed and the admitted writings in the light of the reasons given. The object of expert evidence is to assist the court in forming its own opinions.

Even if an expert's opinion was not reliable in any particular case a court is not-absolved from the duty of forming its own opinion about the disputed handwriting (also *see* AIR 1937 Cal 99). There are certain well-known criteria, such as the examination and comparison of individual characteristics and idiosyncrasies, which have to be employed by experts as well as by courts in arriving at their conclusions.

Mr. C.S. Saran, appearing for some of the appellants, argued that it is very hazardous for a court to act as an expert and to form its own opinions from the individual characteristics, spacing, size, thickness and slant of letters, or the pen pressure at various points, pen-lifts, pauses, and the pictorial effect of the whole writing. The task of arriving at a sound opinion is always fraught with difficulties. A court cannot, for that reason, either abandon its duty of forming its own opinions or reject the opinions of a qualified expert merely because his evidence belongs to the variety known as "opinion evidence". In the absence of better evidence, opinion evidence has to be utilised by courts of law in forming their own opinions. The only effective safeguard against erroneous conclusions is for courts to use their own powers of observation well and to study and use the recognised tests in a manner which satisfied the conscience of the court. I have noted the commendable care and attention with which the trial court has used the opinions of Mr. Gregory (P.W. 286). It arrived at its own conclusions after testing the opinions of the expert by close examination of the documents about which the opinions were given. I have also tested the reliability of the opinions of Mr. Gregory by closely examining the disputed and admitted writings once again for the purposes of forming my own opinions with the help of the expert evidence. Far from finding this method objectionable, I am not able to find any other more satisfactory way of testing the reliability of expert evidence in a case.

In *Ram Chandra's* case[62] their lordships of the Supreme Court examined the contents of a document and relied upon internal evidence in addition to other external and corroborative evidence before accepting the expert evidence about the writing before their lordships. A comparison of disputed and admitted writings, which are pieces of evidence on record, is also a method of examining the internal evidence of a document and of judging whether it

62. AIR 1957 SC 381 : 1957 Cr LJ 559.

finds support from other evidence on record which is external *qua* the document containing the disputed writing. Another method of testing whether the opinion of an expert should be accepted or not, suggested by what was laid down in *Ram Chandra's* case, is to look for other kinds of circumstantial or direct corroborative evidence on record. It is certainly hazardous to rely upon expert evidence solely without any corroboration from other kinds of evidence in the case. But it is seldom that a prosecution case hinges purely on expert opinion evidence. Usually, there is also other evidence as there is in this case.

My attention has been drawn by Mr. Hamid Husain, appearing for the State, to two cases in which their lordships of the Privy Council examined the disputed and the accepted writings in order to arrive at their own conclusions (See *Manindra Chandra Lala v Mahaluxmi Bank Ltd,* ILR (1945) Kar PC 225 : 49 Cal WN 481 : AIR 1945 PC 105 (107) ; and *G. Madhavayya v G. Achamma,* (1949) 2 Mad LJ 716 : AIR 1949 PC 325 (329). Indeed, section 73 of the Indian Evidence Act, empowers courts of law to compare admitted and disputed writings for the purposes of forming their own opinions. The rule of caution is not to base a conclusion entirely upon the court's own comparison because the court's function is distinct from and above the role of an expert witness giving evidence on handwriting which is tested by cross-examination: (See *Bhagwan Din v Gouri Shankar,* AIR 1957 All 119 and *Fazaluddin Mandal v Panchanan Das,* AIR 1957 Cal 924). The court is, however, bound to form its own opinions with the aid of all the permissible methods, and to arrive at a conclusion where a conclusion can safely be arrived at. Such a conclusion can safely be arrived at where the conclusions, of a court, after comparing the admitted and disputed writings, coincide with the opinions of the expert and are further corroborated by other pieces of evidence. In other words, the method contemplated by section 73 of the Evidence Act, can and ought to be employed by courts in order to test and find corroboration or contradiction of the opinion of the expert. The court does not in such a case function as a handwriting expert itself, but it acts as the authority charged with the duty of arriving at a conclusion with the aid of all the data upon the record by all legally permissible means at its commands (See *Bisseswar Poddar v Nabadwip Chandra Poddar,* AIR 1961 Cal 300 : 64 Cal WN 1067 : 1960 Cal LJ 190). With great respect, I find myself in complete agreement with what was laid down in *Fazaluddin's* case,[63] by the Calcutta High Court per KCD Gupta, J.:

> *It is true, if there was no evidence before the court as regards the genuineness of the signature, the court could not, in law, rely on its own examination of the signature to supply the evidence because the learned judge could not treat himself as an expert. I am unable to find anything in principle or authority which bars the judge of facts from using his own eyes and looking at the admitted signature along-with the disputed signature in deciding whether the evidence that has been given as regards the genuineness of the documents should be believed or not.*

If the opinion of the handwriting expert is found by a court to be honest and reliable after subjecting it to the recognised tests of soundness, it can even be considered better evidence than the evidence of indifferent witnesses whose motives are often mixed and whose powers of observation and recollection are very faulty. The observations of the expert are far more careful and guided by scientific knowledge and skill which where they exist must be duly appreciated. Prof. Wigmore the celebrated authority on the Law of Evidence, wrote in 1910 in his introduction to Mr. Osborn's book on *"Questioned Documents"* 2nd Edn:

> *A century ago the science of handwriting study did not exist. A crude empiricism still prevailed. These hundred years past have seen a vast progress. All relevant branches of modern science have been brought to bear. Skilled students have focussed upon this field a manifold of appurtenant devices and apparatus. A science and an art have developed. A firm place has now been made for the expert witness who is emphatically scientific and not merely empiric.*

63. AIR 1957 Cal 924.

An objection put forward to the opinion of the expert in this case is that he has admitted that there are deliberate attempts at disguise in a number of writings. The existence of disguise certainly makes the task of the expert and of the court more difficult. The obstacles placed by it are, however, not insurmountable. Certain rules have been formulated and discussed by Dr. Harrison, the Director of the Home Officer, Forensic Science Laboratory in Britain in his book on *Suspect Documents,* (1958), as guides for piercing the disguise. These are as follows:

1. Most disguise is relatively simple in nature.
2. Disguised handwriting exhibits less fluency and poorer rhythm than the normal hand.
3. Any change in slope introduced as a disguise is rarely constant.
4. Disguised handwriting often contains altered letters.
5. The internal consistency of handwriting is disturbed by the introduction of disguise.
6. Originality in disguise is rare.
7. Disguise is rarely consistent.
8. Certain features are rarely disguised.

Another objection put forward against Mr. Gregory as an expert witness in this case was that he had been acting as a consulting expert of the Criminal Investigation Department of Uttar Pradesh. It was, therefore, argued that he could not be impartial in his opinions but must be presumed to be interested in making the prosecution case successful. It has also been suggested that experts are bound to give opinions in favour of parties consulting them. The duty and interest of an expert; if he wants his individual opinion to carry some weight and enjoy a good reputation, is to be scrupulous and impartial. If the expert has some professional pride or even regard for his own self-interest, he will not, for the sake of some small immediate advantage, jeopardise the value of his opinion and degrade the status of his profession by making his knowledge and skill serve as tools of dishonest parties. An expert who gives dishonest opinions is quite certain to be exposed by ruthless cross-examination and to be soon found out by astute courts which do not and should not readily accept expert opinions without rigorously testing what an expert has to say. I do not think that a presumption is a legitimate weapon for demolishing the testimony of an expert with such a background and standing as those revealed by Mr. Gregory. His opinions could certainly be demolished by superior reasons to support contrary conclusions or by convincing proof that they are not honest.

One of the ways in which the honesty of an expert can be tested is to consider the number of instances in which he has given opinions contrary to the opinions which those who consult him may be presumed to desire. I find that Mr. Gregory has given quite a number of opinions rejecting the disputed handwritings sent to him after comparing them with the admitted handwritings. In other cases, I have also found that his opinions are not dogmatic or obstinate. It has been held in *Subodh Kumar Banerjee v Soshi Kumar Banerjee,*[64] that an expert is entitled to more credit if his answers indicate that he appreciates the other side of the case, and can and does look at the problems before him impartially. The general impression created by the replies to the cross-examination of Mr. Gregory, from this point of view also, is quite favourable.

64. AIR 1958 Cal 264.

The worth of the expert's opinions with regard to the handwriting of each appellant can only be judged by examining his reasons and comparing the admitted and the disputed writings about which the opinion was given. As I have already indicated, I propose to adopt the method of judging the reliability of the evidence of the handwriting expert with reference to each accused person. Another test which I propose to employ is to see whether the effect of the expert evidence is corroborated by other kinds of evidence in the case from other sources such as the approver's evidence about handwritings, the confession, and the evidence of other witnesses. I have already held that the evidence of the approver and the confession of Abdul Hameed can be used in this case for the purpose of finding corroboration for the evidence of handwriting as they are not so unreliable as to merit total rejection even if the part of the approver's statement relating to the two alleged meetings of conspirators is so thoroughly unreliable that it must be rejected.[65]

10.26.13 Court's Scrutiny of Handwriting[66]

It has been urged by the learned counsel for the appellant that the learned Sessions Judge has wrongly convicted the accused. The accused had, in fact, paid the amount of Rs 40 to Rajeshwar Singh in the presence of Sawan Mal and that it was fully proved from evidence but the conclusion drawn by the learned Sessions Judge was quite wrong. I do not agree with the learned counsel for the appellant on this point. After going through the evidence, I am of the view that the learned Sessions Judge was right in holding that it had been proved from the statements of Sarvshri Rajeshwar Singh, Prem Singh Pathania and Swan Mal that the signatures on the money order were not those of Rajeshwar Singh and Sawan Mal. Rajeshwar Singh had denied the receipt of the money. He was a student in the Government Higher Secondary School, Nagpur, and Sawan Mal (P.W.) who is alleged to have signed the money order receipt as an attesting witness in token of payment of the money was a teacher in that school. There is nothing brought on the record by the defence as to why these persons should have been interested in deposing against the accused. It is also pertinent to note that the specimen handwriting of the accused was taken in the presence of the magistrate, who had appeared as a witness for purpose of comparison and the same was sent to the handwriting expert who had not been examined as a witness although a report has been received from him. The prosecution had prayed for examination of the handwriting expert to prove the report but the learned Sessions Judge on the objection of the counsel for the accused rejected the application for examination of the handwriting expert as the name of the handwriting expert did not figure in the list of the witnesses and that the prayer was made at a very late stage and the case was pending since a very long time.

In this court the learned counsel for the appellant has taken up this objection that in the absence of examination of the handwriting expert it could not be said whether the signatures were forged or were those of Rajeshwar Singh and Sawan Mal. That is true but this fact is quite apparent from the record that the accused stated that he did not know English. But on the endorsement he has put down his signatures in English and again when the specimen signatures which have been proved by the testimony of the magistrate as also the investigating officer were written by the accused and that belies the stand of the accused that he does not know English. The learned Sessions Judge, no doubt, has wrongly rejected

65. *Devi Prasad v State of Uttar Pradesh*, AIR 1967 All 64 : 1967 Cr LJ 134 (All). Also see *Ravjappa v Nilakanta*, AIR 1962 Mys 53 : 1960 ILR Mys 1206 : (1962) 1 Cr LJ 441 (Mys); *State of Madhya Pradesh v Dhannelal*, 1961 (2) Cr LJ 233 (MP); *Amir Chand v Lok Nath*, AIR 1951 P&H 90(1) : AIR 1952 J&K 26 : 1952 Cr LJ 1230 (Nag); *Sripada Sinai Duclo v State of Goa, Daman and Deo*, 1976 Cr LJ 145.
66. *Salig Ram v State of Himachal Pradesh*, (1972) 2 Sim LJ 335 : 1973 Cr LJ 1030 (HP).

the prayer of the prosecution for examining the handwriting expert. But in the absence of the non-examination when the necessary material is there the court under section 73 of the Indian Evidence Act, can also examine the disputed handwriting with the specimen handwriting which is taken by the magistrate and is admitted by the accused to have been written by him.

From the comparison of the same I find that the disputed signatures are also in the hand of the same person who has written the specimen writing. The accused has furnished a very funny explanation about the specimen handwriting. According to him he does not know English and that the investigating officer had written down on one paper and he asked him to copy the same. He copied out the same with the specimen. It is really unbelievable that an illiterate person can copy the writing and I think the learned sessions judge was right in not accepting this explanation given by him about the specimen signatures and I am of the view after comparison of the specimen handwriting with the disputed one that they are written by the same person, *i.e.*, the accused. Therefore, the non-examination of the handwriting expert is not going to make any difference.

10.26.14 Court as Expert: Miscarriage of Justice[67]

Now while it is competent on the part of a judge or a magistrate to compare the disputed signatures with the admitted signature for himself, *vide* section 73 of the Indian Evidence Act, it is unsafe to rely entirely on such personal comparison. Reference may be made in this connection to the decisions in some important cases; *JC Glastaun v Sonatan Pal*, AIR 1925 Cal 485 : 78 IC 668 ; *Darshan Singh v Prabhu Singh*, AIR 1946 All 67 : ILR 1946 All 130 and *Kessarbai v Jethabhai Jivan*, AIR 1928 PC 277 : 28 Mad LW 737. Thus, it cannot be said that there was a judicial enquiry of the matters before the court; the decision was rather arbitrary and so resulted in a manifest miscarriage of justice.[68]

10.26.15 Court Incompetent as Expert[69]

Learned counsel for the appellant has urged that the court itself has assumed the role of an expert in this case. I do not, however, think that the court's competence to use its own eyes for the purpose of deciding whether the two handwritings placed before it were similar or not can be questioned.

It has been held in *Parsad Mahto v Mt Jasoda Koer,*[70] that where a case against a person depends upon a comparison of the handwriting the court is competent to use its own eyes for the purpose of deciding whether certain handwritings placed before it are similar or not. In a matter of this kind, the court cannot certainly act like an automation accepting without scrutiny an expert's opinion as infallible.[71]

67. *SM Basu v SR Sarkar,* (1961) 2 Cr L J 204 (Cal).
68. *SM Basu v SR Sarkar*, (1961) 2 Cr LJ 204 (Cal).
69. *Abhayanand Mishra v State of Bihar*, AIR 1959 Pat 328 : 1959 Cr LJ 893 (Pat).
Also see: *Tilakdhari Bhagat v Jagat Rai*, AIR 1961 Pat 76; *Nagappa Chendappa Kolli v Nannibu*, AIR 1960 Mys 220 : ILR 1959 Mys 523.
70. AIR 1937 Pat 328 : 169 IC 823.
71. *Abhayanand Mishra v State of Bihar*, AIR 1959 Pat 328 : 1959 Cr LJ 893 (Pat). Also see *Tilakdhari Bhagat v Jagat Rai*, AIR 1961 Pat 76; *Nagappa Chendappa Kolli v Nannibu*, AIR 1960 Mys 220 : ILR 1959 Mys 523.

10.26.16 Specimens[72]

The only question involved in this revision is whether a court under section 73, Indian Evidence Act, can direct an accused person to give his signatures at the instance of the investigating agency so that after comparison from an expert these could be used against him as evidence. The learned counsel for the State relied on a Full Bench decision of Patna High Court in *Gulzar Khan v State of Bihar,*[73] to argue that such a thing was permitted by law. He also tried to derive help from *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC). In *T Subbiah v SKD Ramaswamy Nadar*[74] *Gulzar Khan's* case (supra) was noticed but it was not followed. Similarly, *Kathi Kalu Oghad's* case was referred and was distinguished. In this case para 10. *Kathi Kalu Oghad's,* case (supra), was reproduced *in extenso*, in para 14, which contains the facts of that case. The learned judge of the Madras High Court observed:

> *Nowhere in this passage we find that section 73 of the Evidence Act authorises the court to take the finger impression or specimen handwriting of the person present in court in the course of investigation by the police.*

The learned judge further observed:

> *This passage makes it abundantly clear that the Supreme Court was not concerned with any other question in relation to the facts of each of these cases. I am, therefore, of the view that there is no basis for the contention of the learned counsel that the Supreme Court has at least indirectly approved the point that the magistrate can take handwriting or signature of the accused in the course of investigation.*

Similar view was expressed by a Division Bench of the Kerala High Court in *Alovsious John v State of Kerala.*[75]

In view of the above cited judgments it is clear that section 73 of the Indian Evidence Act does not contemplate that the accused can be asked, persuaded or coerced to give his handwriting or thumb impressions at the instance of the police so that these may be, at a later stage, used against him. The learned Additional Sessions Judge took pains to make a detailed reference. The learned magistrate transgressed the provisions of the law in directing Dharamvir Singh petitioner to give his signatures at the instance of the police. The order being bad in law amounts to illegality and requires to be quashed. Accepting the reference of the learned Additional Sessions Judge, Ambala, the order is set aside.[76]

10.26.17 Specimen & Article 20(3) of Constitution[77]

What is challenged in this criminal revision application is an order of the city Magistrate, 3rd court, Ahmedabad, asking the accused persons, namely the applicants, to go to the police station and give their handwritings and signatures to the police. It is true that the giving of signatures or giving of handwriting is not hit by Article 20 of the Constitution as held by their lordships of the Supreme Court in *State of Bombay v Kathi Kalu.*[78] But the question before me is not whether the giving of signatures or giving of handwriting is hit by Article 20 of the Constitution, but the question is whether the Magistrate has the power to ask the accused persons who are on bail to go to the police and give their specimens of signatures and handwriting. The powers of Magistrates and police officers are prescribed under various laws. Those powers cannot be

72. *Dharamvir Singh v State*, 1975 Cr LJ 884 : 1974 Pun LJ (Cri) 439 : 1975 Cur LJ 132.
73. (1962) 2 Cr LJ 84 : 1962 BLJR 604 : AIR 1962 Pat 255 (FB).
74. AIR 1970 Mad 85 : 1969 Mad LW (Cri) 117 : 1970 Cr LJ 254.
75. 1966 Cr LJ 298.
76. *Dharamvir Singh v State*, 1975 Cr LJ 884 : 1974 Pun LJ (Cri) 439 : 1975 Cur LJ 132.
77. *Keshavlal Trikamlal v State of Gujarat*, (1964) 5 Guj LR 298 : (1964) 1 Cr LJ 94 (Guj).
Also see: *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC); *Abdul Gani v Devi Lal*, AIR 1960 Raj 77 : ILR (1960) 10 Raj 152.
78. AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).

enlarged. There must be something in the law for the exercise of power if such power is to be exercised by a police officer or by a Magistrate. If there is no provision in the law for the exercise of a power, that power cannot be exercised by a police officer or by a Magistrate or by a judge.

The learned counsel for the government and the learned counsel for the complainant rely on section 156 and section 157, Code of Criminal Procedure. Of course, the police has got powers of investigation, but that does not mean that the police can compel an accused person to give his specimen signature and handwriting. Section 73 of the Evidence Act provides as follows:

> *73. Comparison of signature, writing or seal with others admitted or proved. In order to ascertain whether a signature, writing or seal is that of the person by whom it purports to have been written or made, any signature, writing or seal admitted or proved to the satisfaction of the court to have been written or made by that person may be compared with the one which is to be proved, although that signature, writing or seal has not been produced or proved for any other purpose. The Court may direct any person present in Court to write any words or figures for the purpose of enabling the Court to compare the words or figures so written with any words or figures alleged to have been written by such person.*

The court may direct any person present in court to write any words or figures for the purpose of enabling the court to compare the words or figures so written with any words or figures alleged to have been written by such person. If the accused is present in court, then the powers given under section 73 of the Evidence Act can be used by the court. But that is not what is being done now. The accused are not before the court and the case against them is still under investigation. No provision of law has been pointed out to me, whereby such a power can be exercised.

The revision application is, therefore, allowed and the order passed by the learned Magistrate is set aside.

10.26.18 Powers of Magistrate for Handwriting Specimen [79]

The learned Counsel for the appellants contended that the prosecution could not obtain the specimen handwritings of the accused for comparison with the letter (Exhibit P 1). He has also submitted that the learned Additional Chief Judicial Magistrate, Bhiwani, did not take any precautions by giving the accused time to think and by apprising them that they were not obliged to give their specimen handwritings. He also did not warn the accused that the disputed letter, if found to be in the handwriting of any one of them, the same could be used against them. A perusal of the court proceedings noted on application (Exhibit P.J.) will go to show that no such precautions were taken by the learned Magistrate. The learned Additional Chief Judicial Magistrate Mr. Vinod Jain was examined by the prosecution as P.W. 4. In his cross-examination, he admitted that before writing statements of the accused, who were not assisted by any counsel, he did not warn them that the statements could be used against them. He stated that though it is not mentioned in the order that the accused were allowed to think, but he allowed them time to think. He further stated that he could not say whether it was necessary for him to append a note about the fact whether time was given to the accused to think or not. He stated further that Sub-Inspector Hira Lal was present throughout in the court when the accused made their statements.

The learned Counsel for the appellants in support of his aforesaid contention cited *State of Uttar Pradesh v Ram Babu Misra*, AIR 1980 SC 791 : (1980) 2 SCC 343 : (1980) 2 SCWR 25. In that case, the Investigating Officer moved the Chief Judicial Magistrate, Lucknow, to direct the accused to give his specimen writing for the purpose of comparison with certain disputed writings. The Chief Judicial Magistrate held that he had no power to do so when the case was still under investigation. The plea of the State was rejected by the High Court and

79. *State of Haryana v Jagbir Singh*, 1996 Cr LJ 2545 : 1996 (1) Cri CJ 706 : 1996 (1) Rec Cri rule 735.

thereafter the matter was taken by the State before the Hon'ble Supreme Court. The Hon'ble Supreme Court held that section 73 of the Evidence Act did not enable Magistrate to give such a direction when the case was still under investigation. Section 73 of the Evidence Act lays down as under:

> 73. *Comparison of signature, writing or seal with others admitted or proved*—In order to ascertain whether a signature, writing or seal is that of the person by whom it purports to have been written or made, any signature, writing or seal admitted or proved to the satisfaction of the court to have been written or made by that person may be compared with the one which is to be proved, although that signature, writing, proved for any other purpose.

The court may direct any person present in court to write any words or figures for the purpose of enabling the court to compare the words or figures so written with any words or figures alleged to have been written by such person.

This section applies also, with any necessary modifications, to finger-impressions."

The Hon'ble Supreme Court in *Ram Babu Misra's* case (AIR 1980 SC 791) (supra) considered the provisions of section 73 of the Evidence Act and observed as under (para 4):

> *The second paragraph of section 73 enables the court to direct any person present in court to give specimen writings for the purpose of enabling the court to compare such writings with writings alleged to have been written by such person. The clear implication of the words 'for the purpose of enabling the court to compare' is that there is some proceeding before the court in which or as a consequence of which it might be necessary for the court to compare such writings. The direction is to be given for the purpose of enabling the investigating or other agency 'to compare'. If the case is still under investigation there is no present proceeding before the court in which or as a consequence of which it might be necessary to compare the writings. The language of section 73 does not permit a court to give a direction to the accused to give specimen writings for anticipated necessity for comparison in a proceeding which may later be instituted in the court.*

The learned Deputy Advocate General for the State-respondent, on the other hand, contended that the only bar on the Magistrate is that the Magistrate cannot under section 73 of the Evidence Act issue a direction to the accused to give his specimen handwriting. He contended that, in the instant case, as a matter of fact, the learned Additional Chief Judicial Magistrate, Bhiwani, did not issue any such direction to the accused to give specimen handwriting and it was the voluntary act of the accused to give their specimen handwritings for comparison.

After carefully perusing the application (Exhibit P. J) moved by the Investigating Officer before additional Chief Judicial Magistrate, Bhiwani, and the proceedings conducted thereupon by the learned Magistrate, we have no doubt that the Investigating Officer had prayed before the learned Magistrate for obtaining the specimen handwritings of the accused for comparison. The learned Magistrate proceeded to record the statements of the accused and it was thereafter that he passed the following order in respect of Jagbir Singh accused on 10 September 1991:

> *Present A.P.P. for the State, both the accused in custody with Investigating Officer Hira Lal, Sub-Inspector of C.I.A. staff, Bhiwani. In view of the statement of the accused, the application is allowed. Let specimen handwriting of the accused be obtained.*

Similar order was passed by the learned Magistrate on 10 September 1991 in respect of Umed Singh accused. The said orders are in substance a direction of the learned Magistrate for obtaining the specimen handwritings of the accused. That being so, in view of the law laid down by the Hon'ble Supreme Court in *Ram Babu Misra's* case (AIR 1980 SC 791) (supra) the learned Magistrate had no jurisdiction under section 73 of the Evidence Act to issue such a direction to the accused to give specimen handwriting. Apart from it, the learned Magistrate did not observe any precautions, while recording the statement of the accused, which contained an admission of the accused Jagbir Singh about the disputed letter being

in his handwriting. Resultantly, the report of the Handwriting Expert is of no consequence. Besides it, if the statement of Daya Nand (P.W. 7) be believed that he had suspicion on Jagbir Singh accused about sending the two letters, one to Telu Ram and the other to him, as early as on 6th/7 September 1991, then the conduct of Daya Nand in not expressing his suspicion on Jagbir Singh in the Daily Diary Report No. 4 dated 8 September 1991 (Exhibit P.M.) throws considerable doubt about these two letters being in existence by that time. As a prudent man, Daya Nand-complainant (P.W. 7) was expected to express suspicion on Jagbir Singh, accused in the said report. Faced with the situation arising out of the non-mentioning of the suspicion on the accused in the report registered *vide* Daily Diary Report No. 4 dated 8 September 1991 (Exhibit P.M.), Daya Nand (P.W. 7) tried to wriggle out of it by saying that he did not make any such statement as is mentioned in the Daily Diary Report (Exhibit P.M.) before S.H.O. Mahender Singh Bhatti. He further stated that, as a matter of fact, it was the S.H.O. himself who got the said report written at his dictation and got the same signed from him. Sub-Inspector Mahender Singh Bhatti (P.W. 12) on the other hand stated, on oath, that on 8 September 1991 he recorded Daily Diary Report (Exhibit P.M.) on the statement of complainant Daya Nand. It will, thus, appear that the prosecution evidence is discrepant regarding the recording of Daily Diary Report (Exhibit P.M.) There appears to be no valid reasons to disbelieve the statement of SI Mahender Singh Bhatti (P.W. 12) regarding the Daily Diary Report (Exhibit P.M.) having been prepared on the basis of the statement made by complainant Dayanand on 8 September 1991. Daya Nand-complainant is a literate person and is a teacher by profession. It cannot be expected that he would sign without any murmur on the Daily Diary Report and without caring to know the contents thereof. In these circumstances, the non-mentioning of suspicion on the accused Jagbir Singh in the said Daily Diary Report (Exhibit P.M.) lodged on 8 September 1991, after the alleged receipt of the letter (Exhibit p 1) addressed to Daya Nand and the letter addressed to Telu Ram, aforesaid, assumes significance and casts a serious and reasonable doubt about the veracity of the prosecution case. Not only this, there is no reference of the letter addressed to Telu Ram, aforesaid in the First Information Report (Exhibit P.L) lodged by Daya Nand. The complainant Daya Nand mentioned in the First Information Report (Exhibit P.L) about the letter addressed to him and about his suspicion based on the said letter in the following words:

> *Now I have full suspicion that Umed Singh and Jagbir Singh have kidnapped my son Manoj Kumar with an intent to kill him. They have either concealed him somewhere or have killed him because a letter written by Jagbir Singh has been found in my house* vide *which ransom of Rs 25,000 has been demanded. I identify his handwriting. I have kept the letter in my house which I will produce before you.*

In view of what has been discussed above, we are of the opinion that the prosecution evidence does not prove beyond shadow of reasonable doubt the receipt of the said letter demanding ransom from Daya Nand and, in any case, there is a great suspicion about the appellant Jagbir Singh writing the said letter and leaving it at the residence of Daya Nand.[80]

10.26.19 Section 73 Cr PC, Confession & Specimen Handwriting[81]

The question that arises for our consideration is how an Investigating Agency is to deal with such a situation? Where should it make such an application? In the face of provisions of sections 24, 25 and 26 of the Evidence Act police cannot force any accused. It cannot record that the writing recovered by the police is written by the accused. It shall be hit by anyone of the above

80. *State of Haryana v Jagbir Singh*, 1996 Cr LJ 2545 : 1996 (1) Cri CJ 706 : 1996 (1) Rec Cri R 735.
81. *Sanjay Goel v State of Uttar Pradesh*, 2001 (3) All Cri R 2384 : 2002 (1) Rec Cri R 356 : 2002 Cr LJ 625 (All).

said provisions of the Evidence Act. No doubt the answer to this question is very difficult but the court cannot shirk from resolving this controversy.

Section 164, Code of Criminal Procedure is the only section which permits a Judicial Magistrate to record a voluntary confession of an accused. If a Magistrate can record a voluntary confession of an accused on an application made by the police on the production of that accused we find it difficult to accept that under the same provision, *i.e.*, section 164, Code of Criminal Procedure why cannot a Magistrate direct the accused whose suspected handwriting has been recovered by the police and if that handwriting is in the form of a confession of his guilt why not such a Magistrate competent to direct such an accused on an application moved by the Investigator before it to give his specimen handwriting so that the recovered handwriting of his may be compared with his specimen writing. However, the courts have to comply with all those safeguards to which an accused is entitled under section 164, Code of Criminal Procedure. If the courts are precluded as argued by the learned Counsel for the defence from making any such direction the dictum of police having unfettered powers shall be thrown to winds. Investigation is nothing but a collection of facts and circumstances as evidence. Obtaining expert's opinion during investigation on a disputed document is nothing but collection of evidence as defined by section 45 of the Evidence Act itself. Thus, in our opinion, section 73 in no way lays any impediment in the exercise of such power by the Judicial Magistrate in the course of investigation. Such a direction may be made under section 164, Code of Criminal Procedure.

Learned counsel for the appellant has cited three decisions of the Apex Court—(1) *State of Uttar Pradesh v Ram Babu Misra*, AIR 1980 SC 791 : (1980) 2 SCC 343 : (1980) 2 SCWR 25 ; (2) *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC) and (3) *Amarjeet Singh v State of Uttar Pradesh,* 1998 SCC (Cri) 1609, wherein the Apex Court has held that during investigation the Magistrate has no power to direct an accused to give his handwriting. Without having any dispute with these decisions, we have probed the issue and we feel that what we have discussed was probably never brought to the notice of the Apex Court while dealing with the situation in those decisions. In one of the judgments, the Apex Court has gone to the extent of directing the Government to amend the provisions of section 73 of the Evidence Act. It is indicative of its anxiety. It has encouraged us to deal this issue in the above manner.

As discussed by us, in our opinion, the handwriting opinion, so obtained during investigation, can be read into evidence despite the bar created by section 73 of the Evidence Act. It has been strenuously urged by Mr. Gopal Chaturvedi, learned Counsel for the complainant that the intrinsic material provided by document admitting his guilt can still be read in evidence as if there is no order passed by the Magistrate for the appellant to give his handwriting. The application contains only the order of production of the applicant and he has just signed the writings with a note "taken in my presence". There is no direction of the Magistrate that the accused should give his specimen writing. The appellant was never commanded by the court to do so. The appellant had every opportunity to decline to give his writing. No objection was ever raised by the appellant in this connection. As a matter of fact he had acquiesced to and rewrote the contents of his alleged written confession, which was ultimately sent by the investigating agency to the Government Handwriting Expert for comparison with his specimen writing, *i.e.*, the confessional statement of the appellant recovered from the room. He sought adjournment once on the ground of his inability on that day to give his writing. His application for adjournment was rejected but at no point of time the appellant had objected or opposed or declined to give his specimen writing nor the court has ever commanded him to do so. In the result there is no bar to the admissibility of this writing in evidence. It shall be a different question what value can be attached to this confession? The contention is that

this written confession has an intrinsic value and the content can legitimately be read by the court. The court itself is competent to compare the disputed handwriting with the admitted writings of the appellant and derive its own conclusions whether the writing is of the same person, *i.e.,* the appellant, and if the court can legitimately come to such a conclusion the admissibility of the document cannot be doubted or challenged. No accused can be compelled to be a witness against himself under the law except as provided by law itself. In that respect he is thoroughly protected, but as earlier stated, the appellant was never compelled by the court. The court had only summoned him but refrained itself from passing any order or direction to the appellant to give his specimen writing or write down the confession again. This we have found on an examination of the record. In the circumstances, we are of the opinion that this confession can be read in evidence and it is not covered by any legal bar. Protection of section 73 of the Evidence Act, so far as the present set of fact and circumstances *vis-a-vis* this written confessional statement are concerned, is not available at all. We, therefore, hold the opinion of the handwriting expert admissible in evidence. Even if for the sake of argument, we accept this argument, yet we can read its content intrinsically.

10.26.20 Admitted Standards[82]

The prosecution called evidence with a view to show that this permit was not signed by W Bennet. Whether Mr. Bennet was available to disprove his own signature is not stated. Of course, he may have left the country. The evidence called to prove that the signature was not genuine was that of Ananta Kumar Purkait, P.W. 5, who was a clerk in Mr. Bennet's office and claimed to know Mr. Bennet's signature. In his examination-in-chief he stated that the signature on Ex. 3 appeared to be like that of Mr. Bennet though he was not sure whether it was Mr. Bennet's signature. In cross-examination he stated that he was very familiar with Mr. Bennet's handwriting and that the signature on Ex. 3 appeared to be similar to that of Mr. Bennet. Later be said that he had no doubt in his mind that the signature on Ex. 3 was the signature of Mr. Bennet. If the evidence be true, then the prosecution was bound to fail. The prosecution, however, tried to suggest that their own evidence should be disbelieved, and they called a handwriting expert. According to that witness the signature purporting to be that of Mr. Bennet on Ex. 3 was not his genuine signature. A handwriting expert's evidence is of very little value and as the learned Sessions Judge points out, the genuine signature with which the handwriting expert compared the disputed signature was merely regarded as genuine because Ananta Kumar Purkait said it was genuine. This witness had stated that the signature on Ex. 3 was also genuine. It seems to me that the evidence of Ananta Kumar Purkait is much more valuable than that of the handwriting expert. But in any event the evidence failed to establish that the permit was not genuine and as I have said, if there was any doubt in the matter the accused was entitled to the benefit of the doubt and to be acquitted.

An attempt was made to show that the writing in the body of the document was not the writing of any clerk in Mr. Bennet's office. But the evidence of the witness who deposed to this is not accepted by the learned Sessions Judge and rightly, how could a man swear that the handwriting on a document was not the handwriting of any one of a large number of clerks in an office?[1]

10.26.21 Photographs[83]

The conspiracy was headed by Yau Mockchi who in a sense was the brain behind the whole racket. The discovery with him of the visiting card and photograph of Laxmipat and the

82. *Tamanlal Rathi v State of West Bengal*, 1952 Cr LJ 1951 (Cal).
83. *Laxmipat Choraria v State of Maharashtra*, AIR 1968 SC 938 : 1968 Cr LJ 1124.

photograph and addresses of Balchand was an incriminating circumstance as Ethyl Wong was connected with Yau Mockchi on the one hand and these brothers at the other. Further, letters and writings of all the brothers were seized which were related to the conspiracy. Unfortunately, the originals were not available at the trial but only Photostats of the letters. The photostats have been proved to our satisfaction to be genuine photographs of the letters. The copies were made through the Indian Embassy and bore the certificate. The use of the photostats without the originals was questioned before us but not in the High Court. Since it was a pure question of law, we allowed it to be raised. It is submitted that expert testimony as to handwriting can only be based upon the examination of the originals and not on photographs. It is pointed out that there is nothing in the Evidence Act which makes a photograph of a disputed writing the basis of conviction. Nor, it is submitted, expert testimony can be invited about it. Reliance is placed on *M'Cullough v Munn,*[84] and *Phipson* on *Evidence,* 10th Edn, p 146.

In our opinion, this submission cannot be accepted. Apart from the fact that this was not argued in the High Court and the handwriting was admitted there, the law as propounded is not sound. The originals were suppressed by the appellants after they were returned. The order of the Supreme Court of Hong Kong has not been produced before us and we do not know why the original documents were returned. Adequate precaution against the suppression of these documents apparently was not taken. This was perhaps necessary because the offence was a part of an international smuggling racket, in which offenders had to be tried in two different countries and both countries needed the documents as evidence. If the Photostats were not available this prosecution would have been greatly jeopardized.

Even if the originals be not forthcoming, opinions as to handwriting can be formed from the photographs. It is common knowledge that experts themselves base their opinion on enlarged photographs. The photos were facsimiles of the writings and could be compared with the enlargements of the admitted comparative material. In *Phipson's book* (10th Edn) paras 316/317, the rule as to identification of handwriting is stated from the Code of Criminal Procedure, 1865 as follows:

> *Comparison of a disputed writing with any writing proved to the satisfaction of the judges to be genuine shall be permitted to be made by witnesses,.....*

In dealing with the scope of the rule, Phipson observes:

> *Under the above Act, both the disputed and the genuine writings must be produced in court, and the former, if lost, cannot be compared, either from memory or from a photographic copy, with the latter, and the latter must also be duly proved therein." (Para 317).*

Phipson himself in para 316 observes that the production of "real" evidence is not now compulsory. For the first part of the proposition in para 317 reference is made to (1908) 2 IR 194 (CA). That was an action for libel contained in a letter alleged to have been written by the defendant. The original was lost but a photographic copy of the letter was available, and the envelope had been preserved. The photograph was seen by the jury but the judge ruled that the photograph was evidence of the contents of the letter but not of the handwriting and could not be compared with other admitted writings. The jury gave a verdict for the plaintiff which was set aside by the divisional court and a new trial was ordered. At the second trial, the photograph was not tendered but a plain copy was put in. The trial resulted in a verdict for the defendant. The divisional court refused to set aside the verdict. The plaintiff then relied upon *Lucas v Williams and Sons,*[85] claiming that the photograph was evidence. The Lord Chancellor, Holmes, LJ, observed:

84. 1908 (2) IR 194.
85. (1892) 2 QB 113 : 61 LJQB 595.

> *The plaintiff would have been justified in putting in the photograph as evidence of the contents of the libel, and apparently it was the only legal evidence by way of copy of its contents; and think they might also on the authority of the decision in Brookes v Tichborne*, [(1850) 5 Ex 929] *have used it for purposes of calling attention to peculiarities of spelling and use of capital letters and punctuation.*

At the first trial Lord Chief Baron ruled (with which Wright, J., agreed in the King's Bench):

> *That upon the loss of the original letter the photograph was admissible to prove the contents of that letter, but that it could not be used for purposes of comparison with genuine documents.*

The above observations have received adverse comments from *Wigmore* (3rd Edn), Vol III, para 797. The earlier cases probably took into account the possibility of trick photography and the changes likely by adjustment of the apparatus. Wigmore rightly points out that unless we are prepared to go to the length of maintaining that exact reproduction of the handwriting by photography is in the nature of things impossible, the photograph must be admissible in proof. Wigmore then observes:

> *The state of the modern photographic art has long outlawed the judicial doubts above quoted. All that can be said is that a photograph of a writing may be made to falsify, like other photographs and like other kinds of testimony, and that a qualified witness's affirmation of its exactness suffices to remove this danger – as much as any such testimonial danger can be removed. Accordingly, it is generally conceded that a photographic copy of handwriting may be used instead of the original, so far as the accuracy of the medium is concerned.*

In the foot-notes to the above passage many cases are cited from various countries and in regard to the Irish case just cited by us, the author observes that it "raised a doubt which was perversely unnecessary".

On the whole, we think that if the court is satisfied that there is no trick photography and the photograph is above suspicion, the photograph can be received in evidence. It is, of course, always admissible to prove the contents of the document, but subject to the safeguards indicated, also to prove the authorship. This is all the more so in India under section 10 of the Evidence Act to prove participation in a conspiracy. Detection and proof of crime will be rendered not only not easy but sometimes impossible if conspirators begin to correspond through photographs of letters instead of originals. Many conspiracies will then remain unproved because one of the usual methods is to intercept a letter, take its photograph and then to send it on and wait for the reply. But evidence of photographs to prove writing or handwriting can only be received if the original cannot be obtained and the photographic reproduction is faithful and not faked or false. In the present case no such suggestion exists and the originals, having been suppressed by the accused, were not available. The evidence of photographs as to the contents and as to handwriting was receivable.[86]

10.26.22 Forged Postcards[87]

The postcards along with some others recovered in the course of different investigations were sent to Nasik for getting an expert opinion as to whether the same were forged or not. P.W. 1, BN Kulthe, expert in forged currency, banknotes and other security items who examined the postcards when produced in court, stated:

> *They were all in sealed conditions. On opening the parcel I found that there was a huge number of postcards and on examination, I found that those were printed from the blocks which were also in the sealed parcels. There were also some genuine postcards in the parcel. The forged postcards*

86. *Laxmipat Choraria v State of Maharashtra*, AIR 1968 SC 938 : (1968) 2 SCR 624 : 1968 Cr LJ 1124. Also *see SP Chokhani v State of Maharashtra*, AIR 1951 Ngp 226.
87. *Parshotam Dass v State*, 1975 Cr LJ 309.

have been printed from blocks manufactured by photography, single and reply postcards. The fine details of Ashoka pillar in the stamp have been impaired due to reproduction and the fine lines in the background appear thick and broken at place. The shapes of letters and dotted lines of the address appear thick and irregular in size. The buff paper used for printing the forged post-cards is of a lighter shade in colour and of smooth surface. The forged postcards have been printed 4 on a sheet and cut while introducing stags which are wider than those found in the genuine postcards.

The deposition disclosed that some of the postcards which were examined by P.W. 1 at Nasik were genuine while many of them were forged. Giving reasons for his opinion that he had found the postcards forged, he deposed that the inks used in printing them differed in shades when compared with the genuine postcards.

A sealed parcel bearing the seals of the India Security Press, Nasik was opened, and the witness stated that the seals on the cloth were genuine.

As the appellant was being prosecuted on account of 2,000 forged postcards allegedly recovered from the Everest Printing Press of which he was the proprietor, the witness on being shown the 20 packets containing them identifying the same stated in examination-in-chief:

These postcards are marked packetwise as Ex. P.W. one-first to 20 of 100 postcards each.

The cross-examination reveals that the identity of the postcards examined by P.W. 1 at Nasik and those shown to him in court in packets Ex. P.W. one-first to 20 was never questioned.

10.26.23 Signature on fictitious bill[88]

The petitioner being the Branch Manager of Indian Overseas Bank opened Cash Credit and Demand loan accounts in fictitious names. The petitioner opened 12 fake Cash Credit and Demand Loan accounts, and sanctioned loans in these accounts against the third party fixed deposit, which was closed by the fictitious Bill of Digi Export. The expert opinion of the forensic lab has verified the signature on the fictitious bill of Digi Export and have confirmed that it was the signature of the petitioner on said bill. The directors of Digi Export have revealed during investigation that such bill was not applied by them. The petitioner along with his associates has caused wrongful loss to the Indian Overseas Bank and wrongful gain to themselves to a tune of more than Rs4 Crores. The petitioner was missing since the fraud was detected in the Branch and his missing report was lodged at P.S. Malviya Nagar to mislead the Police. The petitioner seems to deviate himself from his official banking duties and violated banking rules and regulations which resulted in loss of faith on his person. If the petitioner is released on bail, he may further tamper the prosecution evidence or abscond himself. Therefore, the Bail Application is rejected at this stage.

10.26.24 Copies Admissible[89]

1. On the other hand, Mr. NS Bhatia, the learned counsel for the State of Punjab, vehemently contended that no objection was raised about the admissibility of the secondary evidence at the stage of the trial by the counsel for the accused and it is not open for the learned counsel for the appellants now to raise such objection at this stage. The learned State counsel has relied on *Ajjarapu Subbarao v Pulla Venkata Rama Rao*[90] wherein it was held that a question of proof of a document is a question of procedure and can be waived, if the objection to the secondary evidence is not taken when the same is being allowed to be recorded. The same objection cannot be allowed to be raised in appeal at the appellate stage. The non-raising of objection in fact amounts to a waiver of formal proof by the party against whom evidence is tendered.

88. *Hare Krishna Mishra v State*, 2018 (1) ADR 439 : Bail Appln. No. 2472 of 2016, Decided on 03/08/2017(Del HC).
89. *Tara Ram Chand v State of Punjab*, 1971 Cr LJ 1201 (HC).
90. AIR 1964 AP 53 : (1963) 2 Andh WR 307 : (1963) 2 Andh LT 442.

Similarly, it was held in a case reported in *Mst. Basanti v Phole,*[91] as to the admissibility of a document, *e.g.,* on the score of the document being a copy, should be taken when the witness who is produced to prove to its contents deposes about it. If such objection is not raised at an early stage of the case, it cannot be entertained later on in appeal. I am in perfect agreement with the authorities cited above. It is to be noted that when the evidence of Sarwan Kumar (P.W. 12), who proved the notices Exhibits PR, PS, PT and PU, was being recorded, no such objection was raised on behalf of the appellants. The question of proof is a question of procedure and can be waived. If the counsel for the appellants would have taken objection to the admissibility of the said evidence at the trial that there was no proof on the file of the case that the original documents have been lost, it was open to the prosecution to produce some official of the court or any other witness, who could have deposed regarding the missing file in question, and the objection could be met in this manner. I am clearly of the opinion that this contention of the learned counsel for the appellants is without any force, and the secondary evidence adduced by way of the copies of the notices issued to Kartar Singh appellant in the form of Exhibits PR, PS, PT and PU, cannot be ruled out from consideration.

The learned counsel for the appellants next referred to the provisions of section 65, clauses (e) and (f) of the Indian Evidence Act and contended that according to clause (e) and the proviso thereto, if the original is a public document within the meaning of section 74, only a certified copy of the document is admissible as secondary evidence and no other copy is admissible. He contended that in view of the provisions of section 74 of the Indian Evidence Act, keeping in view clause (ii) of sub-section (1) thereof, the records of the acts of the official bodies and tribunals are public documents. His contention is that the file relating to the encroachment of appellant Kartar Singh maintained in the municipal office is a public document and according to the interpretation given by him to the provisions of section 65, clause (e) and proviso thereto, only certified copies of the notices could be produced as secondary evidence. He contended that the copies of the notices Exhibits PR, PS, PT and PU, nowhere contained the certificate by the competent authority that the same are the correct copies of the originals. Therefore, the same are not admissible in evidence.

Mr. NS Bhatia, the learned counsel for the State of Punjab, on the other hand, contended that the interpretation sought to be put forth by the learned counsel for the appellants to the provisions of section 65 of the Indian Evidence Act read with its proviso, is untenable and the said provisions cannot be interpreted in the manner as is being suggested by him. He relied on a case reported in *Chikka Veerasetty v Nanjundachari*[92], wherein it was held that the provisions of section 65 of the Indian Evidence Act, postulate the admissibility of the uncertified copies of the public document if the originals are destroyed. After considering the respective contentions of the learned counsel for the parties, I am of the considered opinion that this objection of the learned counsel for the appellants is without any merit. Clause (c) of section 65, which provides that in case of clause (e) or (f) a certified copy of the documents but no other kind of secondary evidence is admissible, seems to apply to a case in which a public document is still in existence on the public records and that provision appears to have be an intended to protect the originals of public records from the range to which they would be subject by constant production of such documents in courts in evidence, and the said clause does not interfere with the general rule of evidence given in clause (c), *i.e.,* in case where the original is destroyed or lost. Where the original documents have been destroyed and are not available, it is open to the parties concerned to produce uncertified copies in order to prove the contents of the original documents. If the provisions of clause (e) and the other clauses providing for the production of the certified copies of the documents, under section 65 of the Indian Evidence Act are read in the manner as is being sought to be interpreted by the learned counsel for the appellants, the provisions of

91. AIR 1955 HP 37.
92. AIR 1955 Mys 139 : ILR 1955 Mys 616.

clause (c) of section 65 of the Evidence Act would become redundant in the case where the public document has been destroyed and is not available. In my opinion, clause (c) is quite independent of the provisions of clauses (e) and (f) of section 65 of the Indian Evidence Act and would apply to all cases whether they are public documents or otherwise if the originals are proved to have been lost or not available. Therefore, this objection of the learned counsel for the appellants is overruled.[93]

10.26.25 Carbon Copy as Specimen[94]

The next contention of Shri A Gangadhara Rao for the appellants is that Ex. P-1 is inadmissible in evidence and was wrongly admitted in evidence and that it was wrongly and unlawfully used for comparison of handwriting. Ex. P-1 is written in carbon. P.W. 6, the assistant collector of Central Excise has deposed as follows:

> *Ex. P-1 is a carbon copy. The range officer to minimise the scriptory work, was tearing off the counter-foil and putting it underneath the inner foil with a carbon paper in between and writing the manuscript portion in the inner foil. It is an irregular practice. I pointed out such irregularities in the cases of several range officers. I cannot now give their names.*

It appears from the evidence that strictly speaking, the foil and the counterfoil ought to have been written independently. If they were so written, each foil would be directly in the handwriting of the officer, who issues it (without being a carbon copy). But, due to the irregular practice followed by the officers to save duplication of their work of writing, the foils happened to be in carbon. In this particular case, it is not known for certain as to how it was written and in particular whether the foil was kept under a carbon paper which, in turn, was under a counterfoil.

But, in any case, it appears that, even according to the usual practice, the foil used to be given to permit-holder, was in carbon. In fact, Ex. P-l was the piece which was issued and which actually functioned as permit and enabled the transport of tobacco successfully and so as to make a semblance of lawful transport. It is the very document which was handed over to P.W. 3 and which induced P.W. 3 to believe that the consignment was duty-paid tobacco which was validly transported.

To prove the offence concerned in this case, it was Ex. P-l which was essential and had to be proved. Let us suppose that there was a counterfoil of Ex. P-1 written in pencil and that it was also available to the prosecution for filing in evidence. Even then it would not affect the fact that Ex. P-l was a permit and it was Ex. P-l, and not the counterfoil which was in fact utilised for committing the offence and was received and acted on by P.W. 3 and can be identified by him as such and that, therefore, it is Ex. P-l which must be produced in evidence and proved and not the counterfoil.

Section 62 of the Indian Evidence Act runs as follows:

> *Primary evidence means the document produced for the inspection of the court.*

The document which is said to have been issued by A-1 and which actually functioned in the commission of the offence and which was received by P.W. 3 and can be identified by P.W. 3 is, according to the prosecution, Ex. P-1. So, it was itself primary evidence. Therefore, the contention of the learned advocate for the accused that Ex. P-1 is secondary evidence and that the pencil counterfoil would be the original is not acceptable.

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93. *Tara Ram Chand v State of Punjab*, 1971 Cr LJ 1201 (HC).
94. *Gutta Sriramulu Naidu v State of Andhra Pradesh*, (1963) 1 Andh LT 57 : (1963) 2 Cr LJ 546 (AP).
Also see *Makhan Lal v State*, AIR 1958 Cal 517 : 1958 Cr LJ 1178 : ILR (1959) 1 Cal 563; *Nityananda v Rashbehari*, AIR 1953 Cal 456 : (1952) 89 Cal LJ 204.

In *Sarkar* on *Evidence* (vol 1, 10th Edn) at p 553, it is mentioned as follows:

> *Carbon copies produced by typewriters may for all practical purposes be regarded as equivalent, though the impression on the lower sheets are likely to be imperfect. They are produced by the same stroke which makes the surface impression. In Federal US Co v Indiana L and M Co, 176 Ind 328), in the case of machine carbon copy in triplicate, each one was held an original.*

Explanation 2 to section 62 of the Indian Evidence Act runs as follows:

> "Where a number of documents are all made by one uniform process as in the case of printing, lithography, or photography each is primary evidence of the contents of the rest; but, where they are all copies of a common original, they, are not primary evidence of the contents of the original."

In the present case, if the writer of Ex. P-1 has adopted the usual practice, the counterfoil would be in pencil while the foil (Ex. P-1) would be in carbon. If he wanted to save scriptory work, it is open to him to place the foil above the counterfoil and write with pencil. In such case, the foil would be in pencil and the counterfoil would be in carbon. But, it so happened that the usual practice was to keep the foil below the counterfoil so that the foil would be in carbon and the counterfoil would be in pencil. But, from the nature of the preparation of foil and counterfoil, both would have been written simultaneously by the same person and by the same strokes of the same pencil.

In *Nityananda Roy v Rashbehari Roy,*[95] the learned judge of the Calcutta High Court observed as follows:

> *As I have already stated, what was sought to be proved out of Ex. P-1 was the signature which the petitioner was alleged to have affixed to it. It is, however, not the original signature but a copy appearing on a carbon copy. This carbon copy of the signature may be a piece of secondary evidence within the meaning of section 63(2), Evidence Act, is a copy made by a mechanical process which ensures its correctness, but simply because it is secondary evidence of a proper form, it does not follow that the prosecution was entitled to adduce it in evidence all at once.*
>
> *According to the prosecution, the original was in the possession of the petitioner, and the case, therefore, came under section 65(a). Evidence Act, which speaks of documents in the possession of the party against whom they are sought to be used. But in order that secondary evidence of such documents may be given, it is essential that the procedure laid down in section 66 of the Act should be strictly complied with.*
>
> *The procedure there prescribed is that the party desiring to make use of secondary evidence must, in the first instance, serve a notice upon the party in whose possession the original may be, 'requiring him to produce the original and it is only when such notice is not complied with that the right to give secondary evidence arises. There are certain "exceptions to the rule" laid down in section 66 but it is perfectly clear, "that none of them applies to the present case".*
>
> In that case, the complainant was a private party. He himself wrote the body of the receipt and the accused merely signed it. It was open to the complainant to insist on being given the pencil copy instead of the carbon copy. Still, the complainant's case was that he took the carbon copy. This version of the complainant was commented upon adversely by the learned judges in the following terms:
>
> *The "complainant" came to the court with the somewhat strange story that he entrusted to the petitioner a quantity of gold of the value of about Rs 3,000 and took care to obtain a receipt from him, but that, at the same time, he allowed the petitioner, who was the guarantor of the receipt, 'to keep the original with him and was himself content to receive only a copy.' The manifestly unusual character of a transaction of that kind was commented on by the defence.....*
>
> In that case, the learned judges held that the carbon copy was not a good basis for comparison of signature for the following reasons:

95. AIR 1953 Cal 456 : (1952) 89 Cal LJ 204.

1. *There is authority of books like Osborn or Brewster that carbon copies, particularly copies made on carbon paper used in this country, "cannot generally be relied upon" for purposes of comparison, because the impression made upon such carbon paper is "generally irregular and blotched".*
2. *The deposit on the carbon paper were 'generally wiped off when the paper was folded with the result that all traces of the distinctive characteristics of the writings on it became blurred.*
3. *The accused signed his name on the original of the carbon copy with a fountain pen which was unusual as the common practice was to write with a pencil, if carbon copy were to be available.*

Ground No. 1 states a general proposition, and leaves scope for exceptions in particular cases. The impression in Ex. P-1 is not irregular or blotched. It is very clear and was obviously prepared with carbon paper of good quality. So, in this case, ground No. 1 does not affect the usefulness of Ex. P-1 for comparison or identification of writing. Whether in a particular case, a carbon writing would be less clear and less fit for comparison and identification of writing than a writing in pencil would depend upon the comparative qualities of the pencil and carbon paper.

If a good pencil were used with a bad carbon paper, the pencil copy would be clearer and fitter for comparison than the carbon copy, but the position would be otherwise if the carbon paper was of a good quality and the pencil of a bad quality. Ground No. 2 also does not apply since, in this case, the carbon copy is good, and the impressions are very clear especially as regards the signature. The distinctive characteristics of the writing are all visible and have not become blurred in Ex. P-1. According to the prosecution, in Ex. P-1 not only the signature but the entire writing is in the handwriting of A-1 and therefore, ample material is available for identifying the writing as made in the hand of A.1. Ground No. 3 does not apply to this case for, though it is not known as to whether the counterfoil was in fountain pen or pencil, there is no defect in Ex. P-1. So that decision is easily distinguishable on facts.

In *Makhan Lal Sen Gupta v State,*[96] it was held by the Calcutta High Court that a carbon copy of a search list with certain ink writings on it was not admissible under section 62, Evidence Act. They further observed that, when a mere glance at the document would show that even a part from the ink writings the whole of it could not have been made by one uniform process, it would not satisfy the requirements of section 62 and other sections of the Evidence Act. In the present case, there is no contention that there are any ink writings in Ex. P-1 or that there is any room for doubting the fact that Ex. P-1 as well as its counterfoil were made in one writing.

In the instant case, Ex. P-1 was written and issued by a government officer (accused-1) in his capacity as a government officer, *i.e.,* public servant. In fact, Ex. P-1 was a document issued on behalf of the Central Government as permit. Such permits were being issued, as a general practice to licensees for transport of tobacco and were being accepted and used by them.

So, there would be nothing unusual or worth of comment in merchant receiving the permit, Ex. P-1 which was written and signed in carbon. When a merchant received a permit in carbon copy issued by the government he would be entitled to use it as primary evidence and he need not call for the pencil copy to be filed as original.

The prosecution was not in a position to prove by direct evidence as to who was the person to whom A-1 handed over the permit, Ex. P-1. But the prosecution could and did prove that Ex. P-1 was not handed over to P.W. 2 the person in whose favour it was issued. The learned special judge has observed that the T.P.I. permits were in the nature of cheques because they were evidence of duty having been paid on the tobacco covered by them. This observation is substantially correct. In the case of a cheque issued by a person, the foil is always

96. AIR 1958 Cal 517 : 1958 Cr LJ 1178 : ILR (1959) 1 Cal 563.

primary evidence, even if it were prepared by copying from the counterfoil. In this case, Ex. P-1 is a permit which was issued, irrespective of the general practice by which a counterfoil (corresponding to each foil) was being written and maintained. I am unable to agree that in this particular case, Ex. P-1 was only secondary evidence.

Assuming for argument's sake, without admitting, that Ex. P-1 is secondary evidence and that the counterfoil was written in pencil and that the counterfoil would be the original, even then. Ex. P-1 would be admissible in evidence. The pencil counterfoil along with the other counterfoils in the same book ought to have been in the ordinary course of business left by A-1 in the office and ought to be available with the central excise department. There is evidence of an excise officer (P.W. 1) that the book was not found in the office of range No. 3. So, under section 65(c) of the Evidence Act, secondary evidence can be given of the contents of that pencil counterfoil when the original has been lost or when the party offering evidence of its contents cannot, for any other reason not arising from his own default or neglect, produce it in reasonable time.

If the foil were in the possession of the accused, then he must have got the possession by fraud, *i.e.,* taking into possession and retaining something which he ought to have left in the government records of his office. Under proviso 3 to section 66 of the Evidence Act, no notice is necessary for producing secondary evidence 'when it appears or is proved that the adverse party has obtained possession of the original by fraud or force". Hence, I find that Ex. P-1 was the primary evidence (as we are concerned in this case with what Ex. P-1 contains and not with what is contained in a counterfoil of Ex. P-1 even if there be one) and that even if it were secondary evidence, it was admissible in evidence and was rightly admitted in evidence by the learned special judge.

The identity of the signature and handwriting in Ex. P-l with the signature and handwriting of A-1 has been proved by the witnesses, P.Ws. 6, 8, 17 and 18. They all say that they are familiar with the handwriting and signature of A-1 having become acquainted with the writing and signature in the course of their official duties.

I do not see any reason to disagree with the findings of the learned special judge that Ex. P-1 is in the handwriting and bears the signature of A-1.[97]

10.26.26 Certified Photo-copy Admissible as Substitute for the Original[98]

Learned Advocate Mr. Dodia appearing for accused No. 1 in the trial Court has cross-examined PW 5, at length, but no material contradictions have come on record by the said cross-examination. We are not able to refrain ourselves from making an observation that in this case a deliberate attempt is made to tire out witnesses. For an illustration even after the witness deposed that a portion of the Forensic Science Laboratory report containing material details was torn, a certified true copy was produced. This copy was not certified as true copy by the Customs Officers. It was certified as true copy by the Forensic Science Laboratory officers of the rank of "Assistant Director" and still the cross-examination was made on the line that the Forensic Science Laboratory report at Exh. 101 is a concocted one. This question was repeated. It was then repeated for the third time. Thereafter, it was suggested to the witness that he was not giving out the true facts. The last part of para 45 is suggestive of the fact that the witness is exhausted and tired out. The witness stated that.

> *".....If you are asking for the reason of tallying this information before the Court, then the answer is that I cannot have any such information or any proof of that."*

97. *Gutta Sriramulu Naidu v State of Andhra Pradesh*, (1963) 1 Andh LT 57 : (1963) 2 Cr LJ 546 (AP). Also see *Makhan Lal v State*, AIR 1958 Cal 517 : 1958 Cr LJ 1178 : (1959) ILR 1 Cal 563; *Nityananda v Rashbehari*, AIR 1953 Cal 456 : (1952) 89 Cal LJ 204.
98. *Gulam Nurmamad Theim v State of Gujarat*, 2003 Cr LJ 356 (Guj).

It will also be appropriate to note that the Xerox copy which was sent by the Forensic Science Laboratory after certifying to be true copy has come from the official record of the Forensic Science Laboratory and this Court has no reasons to believe that an officer of Forensic Science Laboratory had any interest in concocting the report against the accused. At no stage, it is the defence of the accused that he had enmity with *X*, *Y* or *Z* of the prosecution agency or that of the Forensic Science Laboratory and therefore, he is wrongly booked.

10.26.27 Authorship from Contents[99]

1. Learned trial judge as well as the learned judges of the High Court have found that there were sufficient number of admitted or proved letters which might well enable Jasawalla and the complainant to identify the signatures of the appellant in the disputed letter. They also laid stress substantially on the contents of the various letters, in the context of the other letters and telegrams to which they purport to be replies and which form the chain of correspondence, as indicating the genuineness of the disputed letters.

Learned counsel objected to this approach on a question of proof. We are, however, unable to see any objection. The proof of the genuineness of a document is proof of the authorship of the document and is proof of a fact like that of any other fact. The evidence relating thereto may be direct or circumstantial. It may consist of direct evidence of a person who saw the document being written or the signature being affixed. It may be proof of the handwriting of the contents, or of the signature, by one of the modes provided in sections 45 and 47 of the Indian Evidence Act.

It may also be proved by internal evidence afforded by the contents of the document. This last mode of proof by the contents may be of considerable value where the disputed document purports to be a link in a chain of correspondence, some links in which are proved to the satisfaction of the court. In such a situation the person who is the recipient of the document, be it either a letter or a telegram, would be in a reasonably good position both with reference to his prior knowledge of the writing or the signature of the alleged sender limited though it may be, as also his knowledge of the subject-matter of the chain of correspondence, to speak to its authorship.

In an appropriate case the court may also be in a position to judge whether the document constitutes a genuine link in the chain of correspondence and thus to determine its authorship. We are unable, therefore, to say that the approach adopted by the courts below in arriving at the conclusion that the letters are genuine is open to any serious legal objection. The question, if any, can only be as to the adequacy of the material on which the conclusion as to the genuineness of the letters is arrived at. That, however, is a matter which we cannot permit to be canvassed before us.

10.26.28 Acceptance of Writer without Direct Evidence[100]

In our opinion, Ex. P-4 has also been proved to have been written by the appellant. It is true that there is no direct proof that the appellant wrote it, nor even proof by any witness that it is in the handwriting of the appellant. But in law that is not necessary. Section 3 of the Indian Evidence Act says:

> *A fact is said to be proved when after considering the matters before it, the court either believes it to exist, or considers its existence so probable that a prudent man ought under the circumstances of the particular case to act upon the supposition that it exists.*

99. *Mobarik Ali Ahmed v State of Bombay*, AIR 1957 SC 857 : 1958 SCJ 111 : 1957 Cr LJ 1346 (SC).
100. *Rayappa Asari, Re,* 1972 Mad LW (Cri) 48 : 1972 Cr LJ 1226 (Mad).

There is nothing in this to show that the proof must be direct. In fact, just as the fact that a murder was committed by an accused may be inferred from circumstantial evidence, it is also permissible in law to infer the authorship and genuineness of a document from circumstantial evidence.

In this particular case there are the following circumstances to prove that Ex. P-4 was written by the appellant. (1) It was recovered from inside the house of the appellant. (2) The contents of Ex. P-4 strongly suggest that the appellant was the author. It refers in detail to the relationship between the appellant and Kamala, and in particular it also refers to their stay in the house of Planiasari of Chinnamariamman Koil Street, Kannakurichi, Salem-8. Reading it with the evidence of P.W. 7 we have no doubt that it refers to P.W. 7. Thus, the evidence of P.W. 7 itself lends corroboration to the contents and the authorship and truth of Ex. P-4. (3) It seems to us that the handwriting in Ex. P-4 is similar to the admitted signatures of the appellant in his statement under section 342, Code of Criminal Procedure before the committal court and the trial court. We may also observe that as a matter of probability it is unlikely that any other person writes out such a letter and kept it on box. Ex. P-4 shows that Kamala was unfaithful to the appellant and that he was not at all happy with her.[1]

10.26.29 Typescript[101]

Next it was argued that the letter was not typed on the office typewriter that was in use in those days, *viz.* article B and that it had been typed on the typewriter article A which did not reach Nagpur till the end of 1946. On this point evidence of certain experts was led. The High Court rightly held that opinions of such experts were not admissible under the Indian Evidence Act as they did not fall within the ambit of section 45 of the Act. This view of the High Court was not contested before us. It is curious that the learned Judge in the High Court, though he held that the evidence of the experts was inadmissible, proceeded nevertheless to discuss it and placed some reliance on it. The trial magistrate and the learned Sessions Judge used this evidence to arrive at the finding that as the letter was typed on article A which had not reached Nagpur till the end of December 1946, obviously the letter was ante-dated. Their conclusion based on inadmissible evidence has, therefore, to be ignored.

[Author's Note: It was an unfortunate decision. Thus, reversed.]

10.26.30 Interested Witness[102]

The opinion of Mr. Bennet suffers from the defect that it was given by a remunerated witness. He knew before-hand why he had been called and what the party calling him wished to be proved. The witness stated that 10 days before he came to court he was approached by the appellant about this case. The appellant told him that he repudiated the two signatures on X and Y. The witness was also given a copy of the evidence of the government handwriting expert before he was examined in court. He further admitted that he had been paid his fees in two instalments before he came to depose. It is not improbable that he had an unconscious bias in favour of the appellant. These circumstances to a great extent detract from the weight to be attached to the witness's opinion.

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101. *Tarafatullah v SN Maitra*, AIR 1952 Cal 919 : 1953 Cr LJ136 (SC). Also see *Hanumant Govind Nargundkar v State of Madhya Pradesh*, AIR 1952 SC 343 : 1952 SCR 1091 : 1952 SCJ 509; *Chelaji Ganaji & Co v Bai Jashodra Bai Shambhu Datt Nishi*, Bom LR 1958 Bom 251.
102. *Abhayanand Mishra v State of Bihar*, AIR 1959 Pat 328 : 1959 Cr LJ 893 (Pat).

10.26.31 Corroboration Needed[103]

1. What is more, defence produced documents from Kidderpore Maternity Hospital in 1941, in the records of which the girl who gave birth to the child signed her name as "Nanda Rani wife of Bani Gupta of 36, Tollygunge Circular Road". This writing and signature were said to be of Shefali and opinion has been given by handwriting expert to be of Shefali. Shefali Ghose, however, denied having given birth to a child at any time in the Kidderpore Maternity Hospital or having made that writing or signature. There was no direct evidence, nor there was any circumstance to provide evidence that the writing and signature purporting to be of Nanda Rani was that of Shefali. The learned Magistrate rightly rejected the claim of Baidya Nath Ghose to prove this writing and signature as being of Shefali because Baidya Nath Ghose does not come within any of the categories mentioned in section 47 of the Indian Evidence Act. In the absence of any direct and substantive evidence on the point, the opinion of the handwriting expert which could have only corroborative value has no use at all. Moreover, the evidence in the expert's testimony is the reason given by him and not the assertion of opinion divorced from reasons. Having examined the writings themselves in the background of the reasons mentioned by the expert witness I am definitely of the view that the opinion of the expert cannot be accepted.[1]

10.26.32 Handwriting evidence need Corroboration[104]

As to the value of expert evidence on disputed handwriting their lordships of the Supreme Court have in *Ramchandra v State of Uttar Pradesh,*[105] observed that it is not safe to treat expert evidence as to handwriting as sufficient basis for conviction. Their lordships, however, have added that such evidence may be relied upon along with other various, items of external and internal evidence relating to the disputed documents.[106]

10.26.33 Indefinite Expert Report - Useless[107]

I would like to mention in particular that although a handwriting expert (P.W. 7) was examined to depose that some disputed signatures of the District Veterinary Officer, SP Dwari (marked X/1 to X/3 compared with his admitted signatures A/1 to 1/15) were forged according to his report (Ext. 27), such evidence is of inconclusive character, because, in the absence of a finding by the appellants for misappropriation of cash no reasonable conclusion can be drawn that either of the appellants committed the forgery. In this connection the authorities are, *Murarilal v State of Madhya Pradesh*, AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396, relied upon in a case reported in *BK Kutty v State*, (1984) 1 Ori LR 597 : 1984 Cr LJ 1289 : 1984 (2) Crimes 183 laying down the principle that it may be hazardous to base a conviction solely on the opinion of the handwriting expert without any independent corroboration.

Before closing the case, I would note the contention of Mr. P.K. Ray to the effect that for the prosecution of the appellants under section 5(2) read with section 5(1)© sanction for the prosecution under section 6 of the Act was neither obtained nor proved in this case. This contention does not merit consideration in view of the fact pointed out by the learned Special

103. *Baidya Nath v Shefali,* (1962) 1 Cr LJ 19 (Cal).
104. *Abhayanand Mishra v State of Bihar*, AIR 1959 Pat 328 : 1959 Cr LJ 893 (Pat). Also see *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559; *Shakti Kumar v Subodh Kumar*, AIR 1964 SC 529; *State v A Gopalan*, MLJ 1966 (Cr) Ker 67; *Sudhindra Nath Dutt v King*, AIR 1952 Cal 423.
105. AIR 1957 SC 381.
106. *Abhayanand Mishra v State of Bihar*, AIR 1959 Pat 328 : 1959 Cr LJ 893 (Pat). Also see *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559; *Shakti Kumar v Subodh Kumar*, AIR 1964 SC 529; *State v A Gopalan*, Mad LJ 1966 (Cr) Ker 67; *Sudhindra Nath Dutt v R*, AIR 1952 Cal 423.
107. *Ajodhya Prasad Misra v State of Orissa*, 1985 Cr LJ 1401 : 1985 (1) Ori LR 326.

Judge that by 3 May 1978, when cognizance of the offence was taken, the appellants had ceased to be public servants, for, appellant Ajodhya had already been retired and appellant Balaram had been dismissed from service. Apart from the decision reported in *State (SPE, Hyderabad) v Air Commodore Kailash Chand*, AIR 1980 SC 522 : (1980) 1 SCC 667 : 1980 Cr LJ 393, the latest decision is reported in *RS Nayak v AR Antulay*, AIR 1984 SC 684 : (1984) 2 SCC 183 : 1984 Cr LJ 613, *RS Nayak v AR Antulay*, in which it was held that the relevant date with reference to which a valid sanction is *sine qua non* for taking cognizance of an offence committed by a public servant as required by section 6 is the date on which the court is called upon to take cognizance of the offence of which he is accused. In view of this proposition, it was not a case in which sanction under section 6 of the Act was necessary.

For the foregoing reasons, in disagreement with the learned Special Judge, I hold that the charges framed against the appellants were not brought home to them beyond reasonable doubt and so the order of conviction and sentence cannot be sustained. Accordingly, the same is set aside and the appellants are acquitted. Fines, if realised, may be refunded. Both the appeals are allowed.

10.26.34 Corroboration Needed[108]

I would next come to the charge of forgery. The case of the prosecution was that a few days after the payment of Rs 325 by P.W. 1 to the appellant, the latter returned the Registration Book with a false entry purported to have been signed by the Regional Transport Officer (P.W. 7) which had been forged and affixing a false seal. It was in the evidence of P.W. 8, one of the investigating officers, that he had taken the specimen signatures and writings of the appellant in the presence of a Magistrate (Mr. R.K. Hota) and Exts. 17 were the specimen writings and signatures of the appellant. Mr. R.K. Hota had not been examined as a witness for the prosecution. It was, indeed, unfortunate that while examining the appellant, the trial court did not take care to ask him as to whether these specimen writings and signatures had been taken from him. The evidence of P.W. 3, the handwriting expert, was that the signature (Y-1) purported to be that of the Regional Transport Officer had not been written by P.W. 7 as compared by him with his specimen writings. It was not in his evidence that this signature had been written by the appellant. P.W. 7 had not testified that this signature, which was not his, was in the hand of the appellant. As regards the disputed entry (Y-2), the evidence of P.W. 3 was that it was in the hand of the appellant as compared by him with the specimen writings of his. It was not in the evidence of P.W. 7, who was supposed to be acquainted with the writing of the appellant, that this writing was in the appellant's hand. The appellant had denied to have written "Y-2". The evidence of the Expert (P.W. 3) in this regard had not received any corroboration. There was no specific evidence that the appellant had been instrumental in putting a false seal in the Registration Book.

It has been laid down by the Supreme Court in *Murarilal v State of Madhya Pradesh*, AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396, that it may be hazardous to base a conviction solely on the opinion of a handwriting expert. But the hazard in accepting the opinion of any expert, handwriting expert or any other kind expert, is not because experts, in general, are unreliable witnesses – the quality of credibility or incredibility being one which an expert shares with all other witnesses – but because all human judgment is fallible and an expert may go wrong because of some defect of observation, some error of premises or honest mistake of conclusion. The science of identification of handwriting is not so perfect, as observed by their Lordships of the Supreme Court. In appropriate cases, corroboration may be sought although there is no rule of law or rule of prudence which has crystallised into a rule

108. *BK Kutty v State*, 1984 Cr LJ 1289 : 1984 (2) Crimes 183 : 1984 (1) Ori LR 597.

of law that opinion evidence must never be acted upon unless substantially corroborated. In the circumstances of the present case, it would not be reasonable and proper, in my view, to base a conviction of the appellant for forgery in respect of the entry marked 'Y-2' without any corroboration.[1]

10.26.35 Brief Reports[109]

In his examination-in-chief Sri Sen gave briefly the reasons in support of his view. He explained that considering presentation, pen-pressure, spacing, relative sizing, terminal, slope, movement, location,, the disputed writing appears to be the writing of the person who wrote Ex. P-17, Ex. P-18, Mr. Chaudhry contended that the reasons given by Sri Sen in support of his opinion were inadequate. It is not necessary for an expert to give reasons at great length in support of his opinion. It is sufficient if the expert gives his reasons briefly. It is always open to the opposite party to require the expert to elaborate any particular point further in cross-examination.

Sri Sen gave out opinions from time to time. Exhibit D-4 is his opinion dated 30 June 1951. Exhibit P-30 is his opinion dated 10 December 1951. Exhibit P-31 is his opinion dated 16 July 1952. In Ex. D-4 Sri Sen wrote that, it was necessary to have signatures of Sarju Mal, Shyam Lal and M. Singh for purposes of comparison. Again in Ex. P-30 Sri Sen wrote:

> *I am unable to identify the writer or writers of the rest of the writings on the basis of the present materials.*

Sri Sen gave the supplementary opinion (Ex. P-31) on 16 July 1952. Mr. Chaudhry argued that the supplementary opinion carries no weight, as Sri Sen had already stated earlier that he was unable to say anything further without additional material. Sri Kehar Singh, Inspector, S.P.E., Lucknow, is P.W. 9. He stated before the court that when the expert demanded more documents for comparison, Sri Kehar Singh sent Exs. P-21 to P-26 again. Exhibits P-21 to P-26 marked by the court correspond to six papers, which were marked by Sri Sen at 14 to 19.

A perusal of the three opinions (Exs. D-4, P-30 and P-31) shows that, five papers marked by Sri Sen as 1 to 5 were used by him as the basis for comparison for purposes of the two opinions (Exs. D-4 and P-30). But for the supplementary opinion (Ex. P-31), he utilised papers marked by him as 14 to 19 in addition to the five papers marked by him as 1 to 5. It, therefore, appears that when Sri Sen gave his supplementary opinion (Ex. P-31) on 16 July 1952, he had with him some additional material, which was not in his possession when he wrote Ex. D-4 or Ex. P-30. It is not, therefore, surprising that, in his supplementary opinion (Ex. P-31) Sri Sen was able to say something about the writing Q-l,

Mr. Chaudhry contended that after all Sri Sen's statement is merely his opinion, and it is not safe to base the appellant's conviction on the opinion of an expert. Sri Sen's opinion is not the only material for holding that the disputed writing and signature are the appellant's writing and signature. We have also got Ram Gopal's statement on the same point. The statements of Ram Gopal and Sri Sen are sufficient to prove that Exs. P-3, P-4 and P-5 were written by the accused.

These three payment orders purport to have been issued by Sri M. Singh, Residential Engineer. Sardar Manmohan Singh appeared before the court as P.W. 3. He stated that the three

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109. *Prem Shanker Misra v State of Uttar Pradesh*, 1956 All LJ 910 : (1957) 2 Lab LJ 177 : 1957 Cr LJ 108 (All). Also see *Haji Mohammad Ekramul Haq v State of West Bengal*, AIR 1959 SC 488 : 1959 SCJ 443 : 1959 SCR Supp (1) 922; *State of Vindhya Pradesh v Krishna Nand*, AIR 1953 VP 21; *State of Bihar v Karu Gope*, AIR 1954 Pat 131 : 1953 BLJR 488 : 1954 Cr LJ 201 (Pat).

signatures purporting to be signatures of M. Singh appearing on the three payment orders are not his signatures. Exhibits P-9 to P-16 are specimen signatures of Sardar Manmohan Singh. In his opinion (Ex. P-30) Sri Sen stated that the person, who wrote the writing marked as 6 to 13, did not write the signatures marked Q-3, Q-6 and Q-9. Thus, from the statements of Sardar M. Singh and Sri Sen it is clear that, somebody forged signatures, which purport to be the Resident Engineer's signatures on Exs. P-3, P-4 and P-5.

Sri Sen was unable to say which person prepared these signatures Q-3, Q-6 and Q-9. It is, however, clear that the three signatures are forged. Further, the body of the three payment orders was prepared by the accused. The charge of forgery has, therefore, been proved against the accused on three counts. These payment orders were prepared in the name of one Sarju Mal. There is evidence to the effect that, a person purporting to be Sarju Mal was committed for the purpose of cheating. So, the offence committed by the accused falls under section 468, Indian Penal Code.

10.26.36 Reports Inadmissible[110]

The document, however, was sent to the expert and it would appear that the opinion forwarded by the expert in writing threw doubt on the genuineness of the document. But the expert was not examined and nothing further was done in that behalf.

The lower appellate court appears to have taken the view that though the expert did not enter into the witness box and did not prove his opinion, a communication received from him could be regarded as evidence and as such can be considered in dealing with the question as to whether the document is genuine or not.

Indeed, in more than two places in his judgment, the learned judge has referred to the opinion of the expert and he has in fact found that the circumstantial evidence which arose about the genuineness of the document was corroborated by the opinion of the expert.

Now in relying on the opinion of the expert the learned judge was really acting upon evidence which had not been proved according to the Evidence Act. The opinion sent by the expert in writing cannot prove itself.

It was essential that the expert should have stepped into the witness box and then perhaps for convenience he may have been permitted to put her opinion on the record so as to enable the opponent to cross-examine him in reference to that opinion.

Unless the expert stepped into the witness box, the opinion expressed by him in a communication to one of the parties could not be treated as evidence under the Evidence Act. Unfortunately, the lower appellate court lost sight of this fact.[1]

10.26.37 Reasons and Illustrations[111]

From the order it appears that the report of the handwriting expert who examined those documents containing grounds of his opinion has been supplied to the accused and on that basis that point has not been considered. The learned advocates appearing for the petitioner and for accused No. 6 state that no such grounds of his opinion have been supplied. The bare opinion of the Chief State Examiner of Questioned Documents, CID, GS, Ahmedabad has been annexed with this application. The learned assistant government pleader is not able to satisfy us by showing that the grounds of opinion have been also supplied to the accused. It is, therefore, necessary to consider whether the accused are entitled to claim the grounds or reasons which led the handwriting expert to give an opinion in respect of the writings in

110. *Parwat Vedu Patil v Sukdev Shivram Patil*, AIR 1956 Bom 617 : 1956 Cr LJ 1069 (Bom).
111. *Chander Bhan v State of Gujarat*, 1971 Cr LJ 167 (Guj).

question. Section 173, sub-section (4) of the Code of Criminal Procedure requires the police officer in-charge of the case to furnish or cause to be furnished to the accused, free of cost, a copy of the report forwarded under sub-section (1) and of the first information report recorded under section 154 and of all other documents or relevant extracts thereof, on which the prosecution proposes to rely, including the statements, The words "and of all other documents or relevant extracts thereof, on which the prosecution proposes to rely" would obviously cover not only the opinion but also grounds or reasons for giving such an opinion given by the handwriting expert. If, therefore, the grounds are sought to be relied upon by the prosecution for determining the question of identity of the handwritings of certain documents in the case, they form one homogeneous document and cannot be separated. It is not that his opinion can be exhibited as in case of some other opinions,, and it has, therefore, to be proved. The expert has, therefore, to be examined and he would have to state before the court his grounds for such an opinion. Those grounds should, therefore, be supplied to the accused if they are sent by him to the investigating officer and that would be in the nature of a statement obtained from him as it were under section 162 of the Code of Criminal Procedure. Besides, the opinion becomes relevant in any such case under section 45 of the Evidence Act. At the same time, section 51 of the Evidence Act provides that whenever the opinion of any living person is relevant, the grounds on which such opinion is based is relevant. In other words, the grounds on which any such opinion is based an opinion which he ultimately gives are both relevant in any such inquiry and if the prosecution were to rely upon any such opinion as a piece of evidence against the accused in any criminal trial, that has to be supplied to the accused under section 173(4) of the Code. If the grounds are not supplied, the accused would not be able to know on what basis such an opinion was arrived at. He would be put to disadvantage in his defence, and fairness in a criminal trial demands that they have to be supplied to the accused. The accused should not be taken unawares at the time of trial for after all, the intention of the Legislature behind section 173(4) of the Criminal Procedure Code is to apprise the accused of all such evidence that is likely to be produced against him in the case. Now when no such grounds, on which the opinion has been given by the expert, are supplied to the accused, as urged before me, the learned Magistrate shall see that the same are supplied to each one of the accused before the trial or inquiry commences.

Now so far as the photographic enlargements of the disputed and admitted writings of the accused are concerned, it is difficult to say that they would be covered within the meaning of "and of all other documents or relevant extracts thereof, on which the prosecution proposes to rely" for the reasons that what the prosecution relies upon are the original documents before the court which are said to have been forged and all that the accused are entitled to claim is only the copies thereof. The copies of such documents have been supplied to the accused and there is no grievance in that respect. The photographic enlargements are taken by the handwriting expert with a view to facilitate his work in arriving at the correct opinion in respect of those writings and they cannot, therefore, be treated as the documents on which the prosecution can be said to rely for the case against the accused. If they are, however, placed before the court at the time of giving evidence, they can be taken for the purpose of facilitating the appreciation of the grounds of the opinion given by the handwriting expert and in respect of which his evidence is being recorded. They can as well be seen by the accused at that stage. If, however, they desire to have any photographic enlargements for the purpose of their defence, it would be open to the accused to make a suitable request to the court for being permitted to take such photographs in the presence of any officer of the court. But they cannot claim as of right any such photographic enlargements of such writings made by the handwriting expert for giving an opinion in respect thereof. The learned Magistrate was, therefore, right in rejecting that part of the request of the accused.

10.26.38 Enlarged Photographs Necessary[112]

It was the submission on behalf of the State, as stated earlier, that the insistence of the accused on the enlarged photographs is not proper because the prosecution does not propose to rely on them. Arguments are advanced before us on the strength of evidence led in the trial court wherein at one stage the handwriting expert said that when he formed an opinion and gave the report with reasons, he had referred to the enlarged photographs and from that he has based an opinion about the particular handwriting before him. It is also stated before us that in answer to the question by the court, the handwriting expert stated that he could have given the opinion without the enlarged photographs. Now whether he could have given the opinion without the enlarged photographs is something which has been brought from him in a hypothetical way because according to the submissions made before us it was a clear case of the handwriting expert that he had referred to the enlarged photographs for forming the opinion. So first of all we shall have to see whether for giving an opinion and also for forming an opinion about the particular handwriting by the prosecution or defence advocate or the defence expert, or for the assessment of the court it would be necessary to have the enlarged photographs. For that it will be worthwhile to refer to the opinions of some experts who have written books on such subjects. The book "*Questioned Documents*" *by Albert S Osborn*, 2nd Edn in chapter V at p 30 mentions that photographs are useful in nearly every questioned document investigation and in many cases it is impossible without them to present the facts to a court and jury in an effective, convincing manner. It further mentions that photographs often make clear what otherwise may be hidden or indistinct, and this fact alone is sufficient reason for their use. It is further observed at p 40 last paragraph that the most important reason for making photographs of a disputed document is that by this means the writing in question can be accurately enlarged so that every quality and characteristic of it can be clearly and properly interpreted whether the facts so shown point to genuineness or to forgery.

Hanna F Sulner in the book "*Disputed 'Document*", 1966 Edn, chapter 4 has observed: "the only proper presentation of proof and the best way to demonstrate the experts reasoning is through the use of a photo enlargement chart representing his opinion." It is further observed at p 32: "it is sufficient to say that any attorney involved in a case requiring the type of demonstrative evidence described before, should seek the service of a competent document expert who is familiar with the various techniques and modern methods of photographing documents or portions of a document." It is further observed in the last paragraph at p 32 that "in most of the questioned document problems it is not only advisable, but imperative to use charts with photo-enlargements because without them it is almost impossible to present the facts to the court and jury in a convincing and effective manner."

In the book "*Law of Disputed and Forger Documents*" by J Newton Baker, 1955 Edition, in Chapter VII, section 71 at p 117, it has been observed:

> *The enlarged photograph provides invaluable assistance in the comparison of the various signatures, especially when the proportions of the writing are so enlarged that the faintest lines or marks, or erasures or additions, which otherwise could not be seen or were so hidden as to escape casual observation, can be appreciated." It is further observed: "To proceed with the trial of a disputed signature without specially prepared and sufficient photographs is plain indiscretion and wilful stupidity that usually proves very costly, and the attorney of experience has seen the reason to regret having done so."*

In the book "*Scientific Evidence in Criminal Cases*" by Andre A Moonsens, Ray Edward Moses and Fred E Inbay, 1973 Edition, Item No. 6 in chapter 2 at p 40 reference to scientific reports, it has been observed: "Unless adequate resources are available to the defendant, the State should not have exclusive pretrial rights to scientific data solely on the strength of the theory that it was the product of analysis and interpretation by the State's employees in the State's laboratories."

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112. *Pravinkumar Lalchand Shah v State of Gujarat*, 1982 Cr LJ 763 : 1981 Guj LH 373 : 1982 (23) Guj LR 116.

At p 41 it has been observed: "In these situations, to deny the defence pre-trial access to the State expert's report is to deny it any pre-trial discovery, for its experts have nothing to examine unless the defence has had the opportunity timewise, and has been farsighted enough to show good cause why its expert should be allowed to participate in the State-conducted examination." It is further observed that "not only should an effort be made to discover the expert's reports, but the discovery motion should also request photographs, notes, diagrams, tape recordings and sketches the expert may have made during his examination. These can be evaluated by a defence expert". It has been further observed in the last paragraph at p 41 that "State fingerprint experts who will testify as to the identity of latent prints, typically use enlarged photographs which should be examined by the defence prior to trial." Though all the references made to the books by the experts on this subject clearly show that in order "to appreciate the handwriting, help of enlarged photographs is a must, even otherwise common practice at the court has clearly shown that in order to come to a proper conclusion about the handwriting, assistance from enlarged photographs is always necessary. If the prosecuting agency has all the resources available to it and can get the opinion of an expert, will it be sufficient to merely throw the opinion and reasons of the expert at the accused when the opinion of the prosecution expert is formed after referring to the enlarged photographs which would clearly show the distinguishing feature? Can that be denied to the accused if the intent of the Legislature by amending the provisions of section 173 of the Code was to make all possible data available to the defence for the proper preparation of the case of the accused before the commencement of the trial? That is the point that has to be considered. It was argued on behalf of the State that the accused could get the photographs either by getting the original before the trial court and getting the photograph or by paying the amount for the requisite copies. We are here concerned with the important aspect of the availability of all the materials to the accused for his proper defence even before the commencement of the trial. It may be that sometime before the trial starts the prosecution would realise as to on what material the evidence of a particular witness is based and if he is an expert witness what he has followed and on what he has relied. If he had got some advantage of referring to some material for coming to his conclusion and if that is found when the trial is proceeding, would it debar the defence from raising a point that in order to prepare for proper defence, the copies of the enlarged photographs on which the expert has relied should be given? If that opportunity is available to the accused, the accused can show the photographs to a private handwriting expert and get proper help. It may be that the accused person who is able to spend may call a private handwriting expert in the court and get the copies prepared but it would be too much to expect that the expert would come to the court and by looking merely to the documents would be in a position to give an opinion and also instruct the advocate of the accused to put questions to challenge the opinion given by the State handwriting expert or there may be cases where the advocate of the accused having sympathy for the accused may himself prepare with the help of the expert's aid and books by properly studying the handwriting. In both the cases the enlarged photographs would be quite necessary. It cannot be said by the State that the persons who can afford the photographs only will be having that benefit by making payment and those who cannot afford it would be deprived of that opportunity. This aspect can never lie in the mouth of a State, as the Legislature has enacted the statute in the form of section 173 of Code of Criminal Procedure with the object of giving the accused a proper opportunity for preparing his defence.

But when this question arises, we have before us a judgment of this court to which we have already referred to and that is in the case of *Himatlal Ratilal Rajyagar v State of Gujrat*.[113] Therein it has been observed by this court that the grounds on which any opinion is based and the opinion which a handwriting expert may ultimately give are both relevant under

113. 12 Guj LR 167 : 1971 Cr LJ 165.

section 45 of the Evidence Act in any such inquiry and if the prosecution were to rely upon any such opinion as a piece of evidence against the accused in any criminal trial, that has to be supplied to the accused under section 173(4) of the Code. But in that very judgment it has been observed:

> *However, photographic enlargements of the disputed and admitted writings of the accused would not be covered within the meaning of "and of all other documents or relevant extracts thereof, on which the prosecution proposes to rely" for the reason that what the prosecution relies upon are the original documents before the court which are said to have been forged and all that the accused are entitled to claim is only the copies thereof. The photographic enlargements are taken by the handwriting expert with a view to facilitate his work in arriving at the correct opinion in respect of those writings and they cannot, therefore, be treated as the document on which the prosecution can be said to rely for the case against the accused. The accused cannot claim as of right any such photographic enlargements of such writings made by the handwriting expert for giving an opinion in respect thereof.*

As this is the pronouncement by this court, Messrs MB Shah and JM Panchal, the learned Public Prosecutors stated that the proposition of law propounded by this court being quite correct, we should not try to consider it in a different way. In this judgment it was observed that it would be sufficient if the accused were given the copies of the forged documents. With respect to the learned judge we may observe that whenever the question of forgery arises, it is a question of making out the handwriting or signature of somebody else and creating a forged document and using it. Whether those particular writings are forged or genuine is a question to be considered. So far as the statement obtained by the police or any other document is concerned, a mere copy of it prepared in the handwriting of somebody else is sufficient because it conveys the contents of the statement or document in original. But so far as a forged writing is concerned, if the opinion is to be given on the mode, pressure, habit of writing,, by looking to the original writing in an enlarged form, can it be said that a mere copy of the writing would give the accused an idea as to what he has to meet with? It can never. It is well-nigh impossible for the prosecution to supply the exact mode of the original writing and the original signatures. So, the only possibility is by giving the photographs and as considered earlier from the opinion of the experts so far as the handwritings are concerned, a naked eye will not be able to do proper investigation into the mode of writing and it would be very difficult for coming to any conclusion about the document being forged or otherwise. For that, scientific help of the enlarged photographs is necessary and if that is available to the prosecution, can it be denied to the defence? So, one thing can be said that mere supply of the copy of the document which is a disputed document would not meet the requirements because the prosecution relies on the original document and its copy written by somebody or prepared by somebody would not give a fair chance to the accused in a trial as it would not be the exact reproduction to test the peculiarity of the writing.

It should be noted that under the old Criminal Procedure Code to which we have already referred to, the accused were not entitled to any copies. We have also considered that with the laudable object of making available to the accused a fair chance of preparing his defence, section 173(4) and (5) are added in the statute by amending Act 26 of 1955. The object of this amendment was *firstly* to avoid delay and to expedite the trial and *secondly*, that before the commencement of the trial the accused must have the clear picture of his case. So far as the Sessions cases are concerned or the warrant trials are concerned prior to the amendment, there were two stages. Before the committal order, evidence was led by the prosecution before the committal court and the defence was entitled to cross-examine, if at all necessary. But that required the prosecution to lay on the table the entire case on which the prosecution relies against the accused. This was known to the accused before the commencement of the sessions trial. Likewise, there was trial before the framing of the charge so far as the complaints, warrant cases based on police reports were concerned. That position has continued so far as the private complaints are concerned

wherein the copies would not be available. But in those cases, also before the charge is framed, the accused would know what is the case of the prosecution. For cases based on the police report, in order to avoid this duplicity and in order to make available to the accused the material on which the prosecution relies, the procedure is changed. In those trials if the expert came with the enlarged photographs, they were available to the accused for observation and if the expert relies on the enlarged photographs, can it not be said that the prosecution relies on the documents? The close examination of the enlarged photographs is the only mode on which the expert relies for forming his opinion. If these things are considered, then it can well be said that they are the documents necessary for the defence and therefore strict hyper-technical way of interpreting the words of section 173(5)(a) or section 207(v) would not be meeting the spirit of the enactments. In the case of *Willie (William) Slaney v State of Madhya Pradesh,*[114] Bose J, observed:

> *The Code is a code of procedure and, like all procedural laws, is designed to further the ends of justice and not to frustrate them by the introduction of endless technicalities. The object of the Code is to ensure that an accused person gets a full and fair trial along certain well-established and well-understood links that accord with notions of natural justice.*

This, therefore, clarifies as to what is the necessity for considering the privilege or right of the accused even in a procedural law. We are considering this because it was attempted to be argued that the provisions of the Criminal Procedure Code being merely procedural, there is no substantive right in the accused and therefore, it does not cut at the root of the ultimate finding of a court. This argument is based on the question whether the court has in the ultimate analysis reached a correct finding where the trial is still proceeding and the accused has to come to vindicate his right in order to get the copies necessary for his defence. We are observing this because from this judgment it has been attempted to be shown to us that the court has also observed that except where there is something so vital as to cut at the root of jurisdiction or so abhorrent to what one might term natural justice, the matter resolves itself to a question of prejudice. Some violations of the Code will be so obvious and it may be possible to show that having regard to all that occurred no prejudice was occasioned or that there was no reasonable probability of prejudice. The question here is still not too ripe as to consider whether any prejudice has been caused to the accused or not. Here is the question of considering the right to the accused to get a particular copy in order to formulate his defence properly. In the case of *Naryana Rao v State of Andhra Pradesh*,[115] the question of not supplying the copies to the accused was considered and therein it was observed that non-compliance of the provisions of section 173(4) has not the result of vitiating the proceedings and the subsequent trial. In that case some copies were not given to the accused and the trial proceeded and then a grievance was made. Considering the amended provisions, the Supreme Court observed as follows (at pp 740–41):

> In order to simplify commitment proceedings preceding the trial of accused persons by a Court of Session, section 207A was added by way of amendment of the Code in 1955. From sub-sections (3) and (4) of that section it is clear that in cases exclusively triable by a Court of Session, it is the duty of the Magistrate while holding a preliminary inquiry, to satisfy himself that the documents referred in section 173 have been furnished to the accused and if he found that the police officers concerned had not carried out his duty in that behalf, the Magistrate should see to it that that is done.

It was submitted on behalf of the State that this judgment merely shows that the Magistrate is to see that the documents referred to under section 173 have been furnished to the accused. It is, therefore, the submission that if the prosecution does not rely on the documents themselves, those documents will not be the documents referred to in section 173 and therefore the documents are not required to be given to the accused. We have to appreciate that under section 207 of the Code of Criminal Procedure, 1973, the Magistrate has to supply those documents. But prior

114. AIR 1956 SC 116 : (1955) 2 SCR 1140 : 1956 Cr LJ 291.
115. AIR 1957 SC 737 : (1958) SCR 283 : 1957 Cr LJ 1320.

to that the Magistrate had to be satisfied and in this very Supreme Court judgment it has been observed that if the Magistrate finds that some documents are not supplied, then the Magistrate should see to it that it is done. Those powers of the Magistrate or the court still continue and if the court finds that the police officer has not sent the requisite document required under section 173(5)(a), then it can certainly direct their production. This we have already considered. But the important observations of the Supreme Court in *Naryana Rao's* case (supra) are as follows:

> *The provisions contained in section 173(4) and section 207A(3) have been introduced by the Amending Act of 1955, in order to simplify the procedure in respect of inquiries lending up to a Sessions trial, and at the same time, to safeguard the interests of accused persons by enjoining upon police officers concerned and Magistrates before whom such proceedings are brought, to see that all the documents, necessary to give the accused persons all the information for the proper conduct of their defence are furnished.*

The portion which we have emphasised would clearly show that the court has not merely to be satisfied by referring to only the documents sent by the police along with the report but the court has to see that the accused persons must have all the information for the proper conduct of their defence. If it can well be said that the necessity of enlarged photographs is there for the defence of the accused, then that cannot be denied to him. We have already considered from the books referred to above that necessity of enlarged photographs is there not only for the expert to reach an opinion but it would be also necessary for the court to come to a proper conclusion about the writings. It does not require to be stressed that the opinion of a handwriting expert is merely an opinion evidence and it is not conclusive. It merely corroborates the evidence led by the witnesses who are familiar with the writings. But in order to come to the conclusion whether the disputed writing is forged or otherwise the prosecution as well as the defence and the court will be required to look to the writing and especially the court shall have to form its own opinion. In order to form this opinion it has been considered by the experts that the presence of enlarged photographs would be of great assistance and if that is necessary for the court, can it be said that they are not the documents which are required to be produced in the court? In the case of *State (Delhi Administration) v Pali Ram,*[116] the Supreme Court has observed (at p 25 of Cr LJ):—[1]

> It is not the province of the expert to act as judge or jury. The real function of the expert is to put before the court all the materials, together with reasons which induce him to come to the conclusion, so that the court, although not an expert, may form its own judgment by its own observation of those materials..... Ordinarily, it is not proper for the court to ask the expert to give his finding upon any of the issues, whether of law or of fact, because, strictly speaking, such issues are for the court or jury to determine. The handwriting expert's function is to opine after a scientific comparison of the disputed writing with the proved or admitted writing with regard to the points of similarity and dissimilarity in the two sets of writings.

These observations clearly show that the expert has to put before the court all the materials together with the reasons which induce him to come to the conclusion. What are those materials? Can it be said that a mere piece of paper on which he has given the opinion and reasons for it, is the material, or the basic material on which he has based his opinion like the enlarged photographs? If the expert has based his opinion on the strength of enlarged photographs, mere reproduction of the reasons would not be sufficient. The court also would not be able to appreciate whether the expert has given a proper opinion or not without referring to the enlarged photographs and finding out the points of similarity or dissimilarity, whatever they may be. So, it is very clear that in order to appreciate the handwriting, enlarged photographs would be necessary and even if the prosecution does not produce them or merely says orally that they do not propose to rely on them, can it not be said that they are the documents on

116. AIR 1979 SC 14 : (1979) 2 SCC 158 : 1979 Cr LJ 17.

which the expert relied to come to the conclusion and therefore they are the documents on which the prosecution relies?

It was submitted on behalf of the State that so far as the giving of copies is concerned, no principle of jurisprudence is involved. A faint reliance was placed on the judgment of the Supreme Court in *Narayan Rao's* case (supra). But that was a question of prejudice but there also the Supreme Court has observed that the documents are necessary for proper conduct of the defence of the accused. Here it is not the question of prejudice because the accused have come with a grievance at the initial stage. The trial has not concluded and therefore if at this stage the court finds that it is necessary for the proper defence of the accused that the enlarged photographs should be supplied, then other questions of prejudice,, would not arise. Reliance was placed on the case of *Bashir Hussain Peshimam v Gulam Mohommed Ismail Peshimam,*[117] by the State to canvass a point that so far as giving of the copies is concerned, the principle of jurisprudence is not involved. In the case before the Bombay High Court there was a question of supplying copies of the statements in a private complaint. So far as the Code of Criminal Procedure is concerned, the copies of the statement and the documents on which the prosecution relies are to be supplied in a case filed on the police report. When that insistence was made, the Bombay High Court negatived it by observing that section 173(4) applies only when investigation is made by a police officer and that too under Chapter XIV of the Code. It was further observed that section 173(4) is purely procedural and only directory. It does not also enact any fundamental principle of criminal jurisprudence as such and hence it cannot be argued that such copies should be made available to the accused on a principle analogous to the one contained in the section. It was further observed that a warrant case instituted on a private complaint is governed by the procedure under sections 252 to 259 and as these sections do not contain any provision similar to section 173(4) for furnishing such copies, the accused is not entitled to get such copies. These observations are made because there was insistence before the court that even in a case where Chapter XIV does not apply and even if it is a case not based on the police report, on the analogy of section 173(4), the copies should be given. This was negatived. Not only that but in that case Mr. Jethmalani, the learned counsel who appeared for the defence, wanted to make the provisions all-embracing by submitting that the prosecution must supply the copies of statements of all persons whom the prosecution did not propose to examine during the trial because that referred to the provisions which were not contained in the Code and still an analogy was being attempted to be applied. The Bombay High Court has observed that section 173(4) is purely procedural and it does not also enact any fundamental principle of criminal jurisprudence. But in the case before us section 173(4) clearly applies. A fine distinction has been attempted to be made that if these principles (propounded by the Bombay High Court) are applied, then because under section 173(5)(a) the police is required to forward only those documents on which the prosecution proposes to rely and it under section 207(v) the court has to give copy of any other document or relevant extract thereof forwarded to the Magistrate with the police report under sub-section (5) of section 173, then if the documents are not forwarded, the strict compliance would not require giving the copies of the enlarged photographs. But we feel that this is too technical an argument because we propose to consider "all documents on which the prosecution proposes to rely" in a broader amplitude with a view to appreciating the availability of the material to the accused for his proper defence. The basic principle of criminal jurisprudence is of fair trial. From the documents supplied to the accused by the prosecution, there must be a guarantee of a fair trial inasmuch as the accused should be informed of all the materials on which the prosecution relies and also all the materials which are to be employed by the prosecution against the accused so that he can prepare his proper defence. In such a case the fundamental principle of criminal

117. AIR 1966 Bom 253 : ILR 1966 Bom 770 : 1966 Cr LJ 1395.

jurisprudence is certainly involved. But in spite of this judgment of the Bombay High Court in the case of *Bashir Hussain* (supra) which showed that in any case instituted on a private complaint not covered by Chapter XIV, the accused is not entitled to copies, the same Bombay High Court in the case of *Govind Raghunath Sawant v BA Kakade,*[118] considered that the copies should be given to the accused for the offences under the Railway Property (Unlawful Possession) Act, 1966. The judgment in *Bashir Hussain's* case (supra) is of a single Judge. *Raghunath Sawant's* case (supra) is also of a single judge. In that case the accused applied for the copies of the statements of the witnesses and the application was rejected by the Presidency Magistrate on the ground that cases under the Railway Property (Unlawful Possession) Act, 1966 involved the procedure under section 252 of the Code of Criminal Procedure and onwards and not under section 251A of the Code of Criminal Procedure and hence copies of documents referred to under section 173(4) of the Code of Criminal Procedure could not be claimed as of right by the accused. The Bombay High Court held that even though there may be no statutory or technical reason why the prosecuting authority should *suo motu* supply copies to the accused or produce them in court, yet for protection and enforcement of fundamental right of defence under Article 22(1) of the Constitution of India and also on ground of ordinary principles of natural justice it is the moral and ethical duty of the prosecutor to at least produce before the court the statements of the witness whom he wants to examine when the accused applies for such production. We must say that we are not considering this aspect on the moral and ethical duty. But we are considering it as the substantive right of the accused and trying to appreciate whether this particular demand of the accused is supported by the principles of criminal jurisprudence. The Bombay High Court considered the impact of Article 22(1) of the Constitution of India on the defence of an accused. The Bombay High Court considered that this is not merely a technical or formal matter or ritual matter; it has to be real. The defence of the accused must be backed by adequate instructions from the client, which can be taken only if the prosecuting machinery enables the defence counsel to know in advance what it has against the accused. This would be all the more applicable when the provisions permit the accused to have the copies of all the documents on which the prosecution proposes to rely. Article 22(1) of the Constitution provides that the accused shall not be denied the right to consult, and to be defended by a legal practitioner of his choice. The Bombay High Court in the above referred judgment in the case of *Govind Raghunath Sawant* (supra) observed that though in a particular case the mandatory provision of section 173(4) of the Code of Criminal Procedure may not be applicable if the accused wants to defend himself with the assistance of counsel and even though the counsel feels it necessary to have statements of the witness for cross-examination under section 145 of the Evidence Act, the prosecution cannot withhold production of such statements in court and the court should not feel powerless and impotent to compel production of such statements. If in the case before the Bombay High Court where provisions of section 173(4) were not applicable and still the Bombay High Court considered it necessary from the broad aspect of considering the defence of the accused that the copy should be made available, there is all the more reason in the instant case to interpret section 173(5) and section 207(v) in a manner which would be advancing the cause of justice so far as the defence of the accused is concerned. So the above referred judgment of the Bombay High Court considered the impact of section 173(4) on a broader canvass and in a different tone from the one in which the decision in the case of *Bashir Hussain* (supra) was given. We for ourselves think that so far as the present dispute before us is concerned the requirement of documents on which the prosecution relies would also cover the enlarged photographs on the basis of which the examiner of questioned document of the State has based his opinion. This we consider from the point of view of the substantial assistance to the accused

118. (1977) 77 Bom LR 214 : 1975 Mah Cri rule 420.

persons in their own defence. In the case of *Maneka Gandhi v UOI,*[119] the Supreme Court, in para 56, observed:

> *The principle of reasonableness, which legally as well as philosophically, is an essential element of equality or non-arbitrariness pervades Article 14. Like a brooding omnipresence and the procedure contemplated by Article 21 must answer the test of reasonableness in order to be in conformity with Article 14. It must be "right and just and fair" and not arbitrary, fanciful or oppressive; otherwise, it should be no procedure at all and the requirement of Article 21 would not be satisfied.*

Article 21 of the Constitution of India, protects the life and personal liberty of an individual by providing that no person shall be deprived of his life or personal liberty except according to procedure established by law. So, the importance of procedure established by law is also enshrined in Article 21 of the Constitution. The Criminal Procedure Code has provided for the procedure about a criminal trial having safeguards for the accused persons in their defence. After 1955 a step in advance was taken in facilitating the accused to formulate his defence properly by providing for the copies of the documents *i.e.*, the enlarged photographs on which the ultimate finding of the document produced by the prosecution, *i.e.*, the reasons of the expert, rests. If the opinion of the expert is based on the strength of observation of enlarged photograph, can it be said that the right given to the accused was protected by refusing a copy of it? If the prosecution can have the same right, denial of that right to the accused would be making the provisions of section 173(5) nugatory. In the case of *Supdt. and Remembrancer of Legal Affairs, West Bengal v Satyen Bhowmick*,[120] in para 22, the Supreme Court has observed that the court has now widened the horizon of the concept of liberty, as contained in Article 21 so as to give the word 'procedure' a very wide connotation. Then the above referred passage from *Maneka Gandhi's* case (supra) was reproduced. In the case of *Satyeen Bhowmick* (supra) the Supreme Court considered the provision of section 14 of the Official Secrets Act. It was observed that section 14 did not in any way deprive the valuable rights of the accused to get copies of the statements of witnesses recorded by the police or the documents obtained by the police during the investigation,, and while considering investigation, and while considering this aspect, , the Supreme Court considered that if section 14 of the Official Secrets Act is considered to deprive the accused of getting any copies of the statement of witnesses, then it would be difficult to uphold the constitutional validity of section 14, as the procedure would become extremely unreasonable, harsh and prejudicial to the accused as a result of which the case would have been tried according to a procedure which will not be in consonance with the provisions of Article 21 of the Constitution. Of course, therein there was a case of providing copies to the accused tried under the particular Act but the provisions of the Code of Criminal Procedure were made applicable and even in such a case the copies were considered essential.

In the case of *Hussainara Khatoon v Home Secy., State of Bihar, (Patna)*[121] Supreme Court considered Article 39A of the Constitution. This was considered from the point of view of free legal service as an inalienable element of 'reasonable, fair and just' procedure. Therein it has been observed that the right to free legal services is clearly an essential ingredient of "reasonable, fair and just" procedure for a person accused of an offence and it must be held implicit in the guarantee of Article 21. It has been further observed that it is a constitutional right of every accused person who is unable to engage a lawyer and secure legal services on account of reasons such as poverty, indigence or in communicated situation and the State is under a mandate to provide a lawyer to an accused person if the circumstances of the case and the needs of justice so requires. Article 39A of the Constitution is in Part IV pertaining to Directive Principles of State Police. The first line of Article 39A is very important. According to that the State shall secure that the operation of the legal system promotes justice, on a

119. AIR 1978 SC 597 : (1978) 1 SCC 248 : (1978) 2 SCR 621.
120. AIR 1981 SC 917 : 1981 Cr LJ 341 : (1981) 2 SCC 109.
121. AIR 1979 SC 1369 : (1979) 3 SCR 532.

basis of equal opportunity.....Thereafter there is the pronouncement about free legal aid by suitable legislation or schemes. But the first part of Article 39A clearly says that operation of the legal on equal opportunity. This is what we are endeavouring to emphasise. In the present case before us, prosecution has all the materials available to it to get the opinion of the handwriting expert on the strength of the enlarged photographs. If that is denied to the accused, can it be said that the operation of the legal system would promote justice on the basis of equal opportunity? In order to follow Article 39A in its true spirit, the opportunity must be equal to the accused as well as to the prosecution and if provisions like section 173(5) require the police or the State to give copies of the material documents to the accused, the accused cannot avail that opportunity properly, if the basis on which the prosecution based the opinion of the handwriting expert would not be available to the accused. As considered by the Supreme Court in the case of *Hussainara Khatoon* (supra) merely because an accused person cannot afford money, he should not be deprived of the opportunity for securing justice. The argument advanced by the State that the documents may be available to the accused for defence if he spends for getting the enlarged photographs can never be appreciated.

A faint attempt was made to strictly interpret the provisions of section 173(5) by saying that it refers to documents, mainly statements recorded by the police and also documents on which the prosecution proposes to rely and therefore it would not cover the enlarged photographs on which the opinion was based. Under section 3 of the Evidence Act 'document' is defined and in the illustrations, words printed, lithographed or photographed are considered as documents. Further under the provisions of section 62 of the Evidence Act, *Explanation* 2, where a number of documents are all made by one uniform process as in the case of photography, each is primary evidence of the contents of the rest. So, if reliance is placed on the photograph, it would be primary evidence. It is not that only the negative of the photograph would be the primary evidence but if the reliance is placed on the positive, it is discernible to the eye and from that the opinion is given it also forms part of the evidence on which the prosecution can be said to rely. Mr. J.M. Panchal, the learned Public Prosecutor, wanted to make a fine distinction about the expert evidence on the strength of section 45 of the Evidence Act. According to him this provision makes the opinion upon the point of identity of handwriting given by the handwriting expert relevant and those persons who gave evidence are experts. It is, therefore, his submission that only the opinion given by the expert would be sufficient and that would be the relevant evidence and therefore there would not arise any question of the photographs on the strength on which he based his opinion. Technically the argument advanced by Mr. Panchal on the strength of section 45 of the Evidence Act would show that mere opinion given by the expert would be sufficient and if this argument is taken to its logical end, the reasons for arriving at the opinion also would not be considered necessary. But this stretching of section 45 is not proper because this court in the case of *Chimanlal Bhogilal Shah v State of Gujarat,*[122]106 has observed that if the prosecution relies on the opinion of the handwriting expert, the accused is entitled to know in advance the reasons of the handwriting expert, for giving such an opinion. If the accused is not supplied with the copy of the reasons, he would not be in a position to confront the handwriting expert properly at the time of the trial. Under section 46 of the Evidence Act, facts, not otherwise relevant, are relevant if they support or are inconsistent with the opinion of experts when such opinion are relevant. It cannot be said that the opinion of the expert is supported by his reasons which are based on examination of the enlarged photographs. Therefore, if the principles embodied in *Chimanlal Bhogilal Shah's* case (supra) are considered properly, then the accused cannot defend effectually without the basis on which the expert proposes to support his opinion or finding, meaning thereby, the photographs. So even this argument attempted to be advanced on behalf of the State would

122. (1973) 14 GLR 807.

not be available. It was submitted on behalf of the State that this is too early a stage for the defence to make a grievance because the trial has not proceeded and it has not shown whether the accused has in any way been deprived of the opportunity to defend himself properly. On the contrary, this argument, if accepted, would create a hurdle in the way of defence because then after the trial the question of prejudice shall have to be examined while this is before the case proceeds any further and the accused wants the copies of the enlarged photographs just to get sufficient help for his defence from the opinion of the expert who would be in a position to help the accused if the enlarged photographs of the handwriting are available for his examination. Therefore, it is the basic requirement according to the accused which will further his chance of defending himself properly and that is rightly submitted. So, it is not that this is a very early stage. The question of prejudice quite often comes up in some cases where the person goes to the trial unmindful of the consequences of his carelessness or neglect in asserting his own right. Under the civil proceedings when a suit is filed on the strength of a plaint, the copy of the plaint is always required to be served to the defendant. If the advocate engaged by the defendant at the initial stages insists on the plaint, he is entitled to it. But if without getting the copy he permits the whole suit to be prosecuted, if he attempts to defend the defendant in the case without a copy of the plaint and gets a decision, then it cannot lie in his mouth to say that the entire proceeding is vitiated because he was not given a copy of the plaint about which he never made a complaint. Here the grievance is made at the early stage and if that grievance is found to be justified inasmuch as the absence of the enlarged photographs would deprive the accused of making out a proper ground for his defence for obtaining the expert advice which has been available to the prosecution, then it will not be in consonance with the criminal jurisprudence which insists on equal opportunity both to the accused as well as the prosecution.

In view of the decisions quoted above, we feel that it should not be the prosecution alone who should have the benefit of scientific method and we feel that the accused also must have that benefit and in order to have that benefit and to give him fair opportunity of defending himself, we consider that the enlarged photographs are a must and we also consider that because the State handwriting expert has based his opinion and the reasons for his conclusion after perusing the enlarged photographs and also that because the enlarged photographs will be necessary to aid the accused and also the court for coming to the proper conclusion about the handwriting, those enlarged photographs can be said to be the documents on which the prosecution proposes to rely and therefore we think that those documents must be available to the accused before the State handwriting expert steps into the witness box or at least to be available to the accused free of cost during the trial to get help from his expert. We are conscious that the duty of giving copies to the accused is now on the court and a time may come when the court will be required to give copies but the court will be doing it with the assistance of the State and the State should never consider the question of expenses while affording an opportunity to the accused to defend himself properly. We are observing this mainly because at some stage during the trial in the lower Court it was stated that the enlarged photographs would cost as much as Rs 2,000 and the State would be required to spend for that. This can never be a consideration before a court when the question of sufficient opportunity to the accused to defend himself is involved. Nor should the court deter from coming to a judicious conclusion on the point of dispute merely because the agency of the court would be required to supply those copies. The entire endeavour shall have to be made by the State to facilitate the observance of the procedure enacted by the Code of Criminal Procedure with its proper interpretation made by the courts from time to time.

In view of the discussions made above, we allow the applications and hold that the accused persons are entitled to the enlarged photographs of the disputed as well as specimen

handwriting and signatures. Rule in all these applications is made absolute. We are thankful to all the advocates who have helped us in deciding this matter.[123]

10.26.39 Evaluation of the Opposing Experts' Evidence[124]

3. Letter Ex. P.W. 20/B has been written by accused Niaz Ali to Raj Mohammad. According to Shri ML Sharma (P.W. 20), it is dated 4 April 1990. This letter also describes the incident of 25th which finds mention in the application (Ex. PMM). It mentions that in the night, Soddo Din, Jai Paul, Tara and Kiran Chauhan climbed the house of the accused persons and started pelting stones. They hurled abuses on which alarm was raised and villagers gathered on which these persons got down and went away. The entire honour had come to an end and that he should inform as to when he was coming or what is to be done and that he should bring Gulzar with him and also the weapon even if the service was to be sacrificed or anything may happen since "*Ab Unka Kam Karna Hai*". He should be informed soon as to on what date he was coming and that the letter is concluded by the wording "*Dil to Aisa Karta Hai Ke Aaj He Bhag Jayon, Par Kya Karyen*".

Learned counsel for the accused submitted that these letters have not been proved to have been written by the accused to whom they have been assigned by the prosecution. In support, the expert opinion of Shri NK Jain (D.W. 1) has been referred. We do not see any substance in this submission for the reason that Shri ML Sharma (P.W. 20) has clearly pointed out that these communications are in the handwriting of the accused.

> ***Looking to the statements of these experts. proving their expert opinion, we prefer to depend on the opinion given by Shri ML Sharma (P.W. 20), Government Examiner on Questioned documents. It is more satisfactory and satisfying. It is more reasonable and dependable. It is more scientific as compared to the opinion of Shri NK Jain (D.W. 1), which is not so thorough and convincing. It is neither reasoned nor satisfactory. There is natural tendency on the part of the expert to support the view of the person who had called him.***

It can, therefore, be said that there is sufficient material on the record for coming to the conclusion that the accused were conspiring with each other and the object of conspiracy was not only the family of Jai Paul but also the deceased. The common object of the conspiracy has been established and the accused had an intention to eliminate the deceased. As to motive, we have already noticed that the families were at logger-heads. They had been fighting with each other and their relations were totally inimical, therefore, it is hardly possible to say that there was no motive for the commission of the crime by the accused.

10.26.40 Specimen Writing — During Trial[125]

In the course of his elaborate arguments, Shri Marwah has tried to make out these points:

(i) The expression "any person" in section 73 includes a person accused of an offence.

(ii) The word "court" in section 73 includes the court of the Magistrate competent to try the offence or hold an inquiry in respect thereof against such accused person under the Code of Criminal Procedure.

(iii) Section 73 does not offend Article 20(3) of the Constitution, because by giving a direction to an accused person to give his specimen handwriting the court does not compel that accused 'to be a witness against himself. *State of Bombay v Kathi Kalu Oghad,*[126] has been relied upon.

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123. *Pravinkumar Lalchand Shah v State of Gujarat*, 1982 Cr LJ 763 : 1981 Guj LH 373 : 1982 (23) Guj LR 116.
124. *Raj Mohammad v State of Himachal Pradesh*, 1995 Cr LJ 810.
125. *State (Delhi Administration) v Pali Ram,* AIR 1979 SC 14 : (1979) 2 SCC 158 : 1979 Cr LJ 17.
126. AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).

(iv) There is nothing in section 73 which prohibits the court from sending the specimen writing obtained by it from the accused to a handwriting expert for opinion after comparison of the same by him with the disputed writing, even if that expert happens to be the government expert of Questioned Documents. A court is fully competent under section 73, to make an order directing the accused to write down words or figures if the ultimate purpose of obtaining such specimen writing is to enable the court trying the case, or inquiring into it, to compare that specimen writing with the disputed one to reach its own conclusion, notwithstanding the fact that, in the first instance, the court thinks it necessary in the interest of justice to send that specimen writing together with the disputed one, to an expert to have the advantage of his opinion and assistance.

(v) The specimen writings taken from an accused person by the court under the second paragraph of section 73 are to all intents and purposes, "admitted writings" within the purview of the first paragraph of the section which read with illustration (c) of section 45, Evidence Act, clearly indicates that such specimen writings can legally be used for comparison with the disputed writing by a handwriting expert, also, irrespective of whether such expert is examined as a witness by any of the parties, or as a court witness by the court acting *suo motu* or on being moved by the prosecution or the defence.

(vi) The government expert of Questioned Documents is supposed to be a high officer of integrity who is not under the influence of the investigating officer and he is expected to give his opinion truthfully about the identity or otherwise of the two sets of writings on objective observations. The mere fact, therefore, that in the instant case, he has been summoned as a prosecution witness will not prejudice the accused, particularly when the court, in the circumstances of the case, thinks it necessary to take the assistance of the expert for reaching its own conclusion on this point.

(vii) The order of the Magistrate, construed as a whole, shows that, in substance, the ultimate purpose of directing the accused to give his specimen writings is that the Magistrate wants to compare the specimen thus obtained, with the disputed writing, to form a just opinion about its identity, after availing himself of the advantage of the expert's opinion.

(viii) This course was adopted by the magistrate in the interests of justice taking into account the conduct of the accused who had been absconding for a long time and was declared a proclaimed offender, and thus avoided to give his admitted or specimen writings at the investigation stage, and later, (it is contended) tampered with the prosecution witness (Tek Chand) who was expected to prove the disputed writing and who, in consequence of the tampering by the accused, realised from his police statement during the proceedings in court, in such a situation, even on the principle underlying section 540 Code of Criminal Procedure, 1898, which governs these proceedings, and is analogous to the principle underlying section 73, para (2). The Magistrate was competent to use the specimen writing thus obtained, for securing the opinion and evidence of the government expert, with a view to assist himself (magistrate) informing his own opinion with regard to the identity of the writing, Ex. P.W. 21 F.

(ix) The action of the Magistrate inasmuch as it sought the specimen writing of the accused to be sent, in the first instance, to the government expert for his opinion and evidence far from being prohibited, was consistent with the principle enunciated by the Bombay High Court in Rudragouda Venkangouda v Basangouda Danappagouda, AIR 1938 Bom 257 : 40 Bom LR 202 which received the imprimature of this court

in *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197. This principle is to the effect that comparison of the other documents not challenged as fabricated, upon its own initiative and without the guidance of an expert is hazardous and inconclusive.

Points (i) and (iii) are well-settled and beyond controversy.

For points (iv) to (ix) Shri Marwah relies on *Gulzar Khan v State,* (1962) 2 Cr LJ 84 : 1962 BLJR 604 : AIR 1962 Pat 255 (FB) and *B Rami Reddy v State of Andhra Pradesh,* (1971) 2 Andh WR 94 : (1971) 2 APLJ 174 : 1971 Cr LJ 1591 (AP). Shri Marwah further maintains that the view taken by a learned judge of the Calcutta High Court, in *Hiralal Agarwalla v State,* ILR (1957) 2 Cal 928 : AIR 1958 Cal 123 : 1958 Cr LJ 367 followed in the impugned judgment by the Delhi High Court, and also by the Bombay High Court in *State v Poonam Chand Gupta,* ILR 1958 Bom 299 : AIR 1958 Bom 207 : 1958 Cr LJ 619, inasmuch as it is held therein that the second clause of section 73 limits the power of the court to obtain the specimen writing of the accused exclusively for own purpose *viz.*, for comparison with the disputed writing by the court itself, is too narrow and incorrect.

The question that falls to be determined in this case is

> Whether a Magistrate in the course of an inquiry or trial on being moved by the prosecution, is competent under section 73, Evidence Act, to direct the accused person to give his specimen handwriting so that the same may be sent along with the disputed writing to the government expert of Questioned Documents for examination, "with a view to have the necessary comparison"?

There appears to be some divergence of judicial opinion on this point. In *Hiralal Agarwala v State,*[127] a learned single judge of Calcutta High Court took the view that section 73 does not entitle the court to assist a party to the proceedings. "It entitles the court to assist itself to a proper conclusion in the interests of justice. It is not open to the Magistrate to send the specimen writing obtained from the accused for examination to an expert who is a prosecution witness". It was, however, conceded that "it is perfectly open to the court to call its own photographer, take the enlargements under its own supervision, study them, and if necessary call its own expert as a court witness in order that it might be assisted to a proper conclusion".

The dictum in *Hiralal Agarwalla's* case was followed by a learned single judge of the Bombay High Court in *State v Poonam Chand Gupta,*[128] wherein it was held that the second clause of section 73 limits the power of the court to direct a person present in court to write any words or figures only where the court itself is of the view that it is necessary for its own purposes to take such writing in order to compare the words or figures so written by such person. The power does not extend to permitting one or the other party before the court to ask the court to take such writing for the purpose of its evidence on its own case.

In *T. Subbiah v SKD Ramaswamy Nada*[129] Krishnaswami Reddy, J, of Madras High Court adopted a similar approach in coming to the conclusion that section 73, Evidence Act gives no power to a Magistrate at the pre-cognizance stage or in the course of police investigation, to direct an accused person to give his specimen handwriting. K Reddy, J, was careful enough to add that "the court for the purpose of comparison can take extraneous aid by using magnifying glass, by obtaining enlargement of photographs or by even calling an expert, all these to enable the court to determine by comparison. There is no basis for the view that the court cannot seek extraneous aid for its comparison but on the other hand, there is an indication in section 73 of the Evidence Act itself that such aid might be necessary".

127. *Hiralal Agarwalla v State,* AIR 1958 Cal 123 : ILR (1957) 2 Cal 928 : 1958 Cr LJ 367.
128. *State of Maharashtra v Poonam Chand Gupta,* AIR 1958 Bom 207 : ILR 1958 Bom 299 : 1958 Cr LJ 619.
129. AIR 1970 Mad 85 : 1969 Mad LW (Cri) 117 : 1970 Cr LJ 254.

As against the above view, a Full Bench of Patna High Court in *Gulzar Khan v State*[130] held that a Magistrate has the power under section 73, Evidence Act to direct, even before he has taken cognizance of the offence, an accused person to give signatures, specimen writings, fingerprints or footprints to be used for comparison with some other signatures, handwritings, fingerprints or footprints which the police may require in the course of investigation. It was remarked that in section 73, the word 'court' must be equated with the court of the Magistrate in a case triable by him or before it is committed to Sessions in a case triable by the Court of Session. As a matter of fact, in every case where the accused is arrested and required to give his specimen handwriting or signature, or thumb-impression, he is arrested under a warrant which must be issued by a Magistrate, or when the police arrest without a warrant in a cognizable offence under section 60 of the Code of Criminal Procedure, he must be produced before a magistrate without unreasonable delay and the procedure under sections 60 to 63 of the Code as also under Article 22 of the Constitution has to be followed and that attracts the provisions of section 73 of the Evidence Act.

In taking this view, the Patna High Court sought support from the decision of this court in *State of Bombay v Kathi Kalu Oghad*[131] wherein the police had obtained from the accused three specimen handwritings to show whether a chit, Exhibit 5, was in the handwriting of the accused, in the course of police investigation of the case, and it was held to be inadmissible by the Bombay High Court, for a different reason *viz.,* on the ground that it was hit by Article 20(3) of the Constitution. This court had held that those specimen writings were admissible.

In *B Rami Reddy v State of Andhra Pradesh,*[132] the High Court of Andhra Pradesh took a similar view. Following the ratio of *Gulzar Khan v State of Bihar,*[133] (supra), it was held that the court does not exceed its powers under the section in directing an accused to give his thumb-impression to enable the police to make investigation of an offence as even in such a case the purpose is to enable the court before which he is ultimately put up for trial to compare the alleged impressions of the accused, with the admitted thumb-impressions.

At the outset, we may make it clear that the instant case is not one where the Magistrate had made the impugned order in the course of the police investigation. Here, the Magistrate has taken cognizance of these two companion cases. The evidence of most of the prosecution witnesses has been recorded. The problem before us is, therefore, narrow than the one which was before the Patna and Andhra Pradesh High Courts in the aforesaid cases. All that we have to consider is, whether the High Court was right in holding that the order dated 20 May 1972 of the Magistrate calling upon the accused before it, to give his specimen handwriting, was beyond the scope of section 73, Evidence Act.

Before considering the scope of section 73, it will be appropriate to have a look at the legislative background of this provision. Section 73 like many other provisions of the Indian Evidence Act, is modelled after the English Law of Evidence as it existed immediately before the enactment of the Indian Evidence Act in 1872.

The English Law on the subject, as amended by the English Acts of the years 1854 and 1865, was substantially the same as incorporated in section 73 of the Indian Evidence Act. Section 48 of the English Act II of 1855 was as follows:

> *On an inquiry whether a signature, writing or seal is genuine, any undisputed signature, writing or seal of the party whose signature, writing or seal is under dispute may be compared with the disputed one, though such signature, writing or seal be on an instrument which is not evidence in the case.*

130. (1962) 2 Cr LJ 84 : 1962 BLJR 604 : AIR 1962 Pat 255 (FB).
131. *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).
132. *B. Rami Reddy v State of Andhra Pradesh,* (1971) 2 Andh WR 94 : (1971) 2 AP LJ 174 : 1971 Cr LJ 1591 (AP).
133. (1962) 2 Cr LJ 84 : 1962 BLJR 604 : AIR 1962 Pat 255 (FB).

Section 48 was repealed and the Criminal Procedure Act, 1865 was passed by the British Parliament. Section 8 of that Act, which still holds the field, provides:

> *Comparison of disputed writing with writing proved to be genuine:* Comparison of a disputed writing with any writing proved to the satisfaction of the judge to be genuine shall be permitted to be made by witnesses; and such writings, and the evidence of witnesses respecting the same may be submitted to the court and jury as evidence of the genuineness or otherwise of the writing in dispute.

This section applies in both Civil and Criminal Courts by virtue of section 1 of the Act.

Apart from this section, it was well-settled that the court in the case of disputed writing, was competent to obtain an exemplar or specimen writing. In any case, the court was competent to compare the disputed writing of the person in question. The position, as it obtained after the passing of the Criminal Procedure Act, 28 and 29 Vict. C. 18, has been summed up by Taylor as follows:

> *Under the Statutory Law, it seems clear … that the comparison may be made either by the witnesses acquainted with the handwriting, or by witnesses skilled in deciphering handwriting, or without the intervention of any witnesses at all, by the jury themselves (Cobbett v Kilminister), or in the event of there being no jury, by the court.....It further appears that any person whose handwriting is in dispute, and who is present in court, may be required by the judge to write in his presence, and that such writing may be compared with the document in question. Deed Devine v Wilson, (*1855) 10 Moo PC 502 (530) *:* 110 rules 83; *Cobbett v Kilminister*, (1865) 4 F and F 490 *(*See *Taylor On Evidence by Johnson & Bridgman, Vol 2, Paras 1870 and 1871, p 1155).*

Let us now compare it with section 73 of the Indian Evidence Act, which runs as under:

> **73. Comparison of signature, writing or seal with others admitted or proved.** *In order to ascertain whether a signature, writing or seal is that of the person by whom it purports to have written or made, any signature, writing or seal admitted or proved to the satisfaction of the Court to have been written or made by that person may be compared with the one, which is to be proved, although that signature, writing or seal has not been produced or proved for any other purpose.*
>
> *The Court may direct any person present in court to write any words or figures for the purpose of enabling the Court to compare the words or figures so written with any words or figures alleged to have been written by such person.*

It will be seen that the first paragraph of section 73 is, in substance, a combined version of section 48 of the English Act II of 1855 and section 8 of the English Criminal Procedure Act, 1865. The Second paragraph of section 73 is substantially the same as the English Law condensed by Taylor in the above quoted portion of para 1871.

Just as in English Law, the Indian Evidence Act recognises two direct methods of proving the handwriting of a person:

1. By admission of the person who wrote it.
2. By the evidence of some witnesses who saw it written.

These are the best methods of proof. These apart, there are modes of proof by opinion. They are:

(i) By the evidence of a handwriting expert (section 45).

(ii) By the evidence of a witness acquainted with the handwriting of the person who is said to have written the writing in question (section 47).

(iii) Opinion formed by the court on comparison made by itself (section 73).

All these three cognate modes of proving involve a process of comparison. In mode (i), the comparison is made by the expert of the disputed writing with the admitted or proved writing of the person who is said to have written the questioned document. In (ii), the comparison takes the form of a belief which the witness entertains upon comparing the writing in question, with an exemplar formed in his mind from some previous knowledge or repetitive observance of the handwriting of the person concerned. In the case of (iii), the comparison is made by the court with the sample writing or exemplar obtained by it from the person concerned.

A sample writing taken by the court under the second paragraph of section 73, is, in substance and reality, the same thing as "admitted writing" within the purview of the first paragraph of section 73. The first paragraph of the section, as already seen, provides for comparison of signature, writing,, purporting to have been written by a person with others admitted or proved to the satisfaction of the court to have been written by the same person. But it does not specifically say by whom such comparison may be made. Construed in the light of the English Law on the subject, which is the legislative source of this provision, it is clear that such comparison may be made by a handwriting expert (section 45) or by one familiar with the handwriting of the person concerned (section 47) or by the court. The two paragraphs of the section are not mutually exclusive. They are complementary to each other.

Section 73 is therefore to be read as a whole, in the light of section 45. Thus, read, it is clear that a court holding an inquiry under the Code of Criminal Procedure in respect of an offence triable by itself or by the Court of Sessions, does not exceed its powers under section 73, if, in the interests of justice, it directs an accused person appearing before it, to give his sample writing to enabling the same to be compared by a handwriting expert chosen or approved by the court, irrespective of whether his name was suggested by the prosecution or the defence, because even in adopting this course, the purpose is to enable the court before which he is ultimately put up for trial, to compare that disputed writing with his (accused's) admitted writing, and to reach its own conclusion with the assistance of the expert.

In the instant case, the magistrate, as the extract from his order dated 20 May 1972, shows after considering the peculiar circumstances of the case, and recalling the observation of the Calcutta High Court in *Hiralal Agarwalla v State,* ILR (1957) 2 Cal 928 : AIR 1958 Cal 123 : 1958 Cr LJ 367 to the effect, that section 73 entitled "the court to assist itself for a proper conclusion in the interest of justice", expressly "applied this test to the present case". The peculiar circumstances which weighed with the magistrate in directing the accused to execute sample writing to be compared, in the first instance, by the Government expert of Questioned Documents, included the contumacious conduct of the accused and the resiling of the material witness, Tek Chand, which, according to Mr. Marwah, was possibly due to his having been suborned or won over by the accused. It was apparent from the record that the accused was playing hide and seek with the process of law and was avoiding to appear and give his sample writing to the police. The magistrate therefore, had good reason to hold that the assistance of the government expert of Questioned Documents was essential in the interest of justice to enable the magistrate to compare the sample and the questioned writings with the expert assistance so obtained and then to reach a just and correct conclusion about their identity. Although the order of the magistrate is somewhat inartistically worded, its substance was clear that although initially, the specimen writing sought from the accused was to be used for comparison by the government expert, the ultimate purpose was to enable the court to compare that specimen writing with the disputed one, Ex. P.W. 21 F, to reach a just decision.

In the revision petition filed by the accused before the High Court a grievance is sought to be made out that the magistrate's order will work prejudice to the defence and enable the prosecution to fill gaps and loopholes in its case. This contention was devoid of force. Once a magistrate is seized of a case, duly forms an opinion that the assistance of an expert is

essential to enable the court to arrive at a just determination of the issue of the identity of the disputed writing, the fact that this may result in the "filling of loopholes" in the prosecution case is purely a subsidiary factor which must give way to the paramount consideration of doing justice. Moreover, it could not be predicted at this stage whether the opinion of government expert of Questioned Documents would go in favour of the prosecution or the defence. The argument raised before the High Court was thus purely speculative.

In addition to section 73 there are two other provisions resting on the same principle, namely. Section 165, Evidence Act and section 540, Code of Criminal Procedure, 1898, which between them invest the court with a wide discretion to call and examine anyone as a witness, if it is *bona fide* of the opinion that his examination is necessary for a just decision of the case. In passing the order which he did, the magistrate was acting well within the bounds of this principle.

The matter can be viewed from another angle, also. Although there is no legal bar to the judge using his own eyes to compare the disputed writing with the admitted writing, even without the aid of the evidence of any handwriting expert, the judge should, as a matter of prudence and caution, hesitate to base his finding with regard to the identity of a handwriting which forms the sheet anchor of the prosecution case against a person accused of an offence, solely on comparison made by himself. It is, therefore, not advisable that a judge should take upon himself the task of comparing the admitted writing with the disputed one to find out whether the two agree with each other; and the prudent course is to obtain the opinion and assistance of an expert.

It is not the province of the expert to act as a judge or jury. As rightly pointed out in *Titli v Jones*[134] the real function of the expert is to put before the court all the materials, together with reasons which induce him to come to the conclusion, so that the court, although not an expert, may form its own judgment by its own observation of those materials. Ordinarily, it is not proper for the court to ask the expert to give his finding upon any of the issues, whether of law or fact, because strictly speaking, such issues are for the court or jury to determine. The handwriting expert's function is to opine after a scientific comparison of the disputed writing with the proved or admitted writing with regard to the points of similarity and dissimilarity in the two sets of writings. The court should then compare the handwritings with its own eyes for a proper assessment of the value of the total evidence.

In this connection, the observations made by Hidayatullah J,. (as he then was) in *Fakharuddin v State of Madhya Pradesh*[135] are apposite and may be extracted (at pp 1328, 1329):

> *Both under sections 45 and 47 the evidence is an opinion, in the former by a scientific comparison and in the latter on the basis of familiarity resulting frequent observations and experience. In either case, the court must satisfy itself by such means as are open that the opinion may be acted upon. One such means open to the court is to apply its own observation to the admitted or proved writings and to compare them with the disputed one, not to become handwriting expert but to verify the premises of the expert but in one case and to appraise the value of the opinion in the other case. The comparison depends on an analysis of the characteristics in the admitted or proved writings and the finding of the same characteristics in a large measure in the disputed writing. In this way, the opinion of the deponent whether expert or other is subjected to scrutiny and although relevant to start with becomes probative. Where an expert's opinion is given, the court must see for itself and with the assistance of the expert come to its own conclusion whether it can safely be held that the two writings are by the same person. This is not to say that the court must play the role of an expert but to say that the court may accept the fact proved only when it has satisfied itself on its own observation that it is safe to accept the opinion, whether of the expert or other witnesses.*

Since even where proof of handwriting which is in nature comparison exists, a duty is cast on the court to use its own eyes and mind to compare the admitted writing with the disputed

134. AIR 1934 All 273 : ILR 56 All 428.
135. AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.

one to verify and reach its own conclusion, it will not be wrong to say that when court seized of a case, directs an accused person present before it to write down a sample writing, such direction in the ultimate analysis, "is for the purpose of enabling the court to compare" the writing so written with the writing alleged to have been written by such person, within the contemplation of section 73. That is to say, the words "for the purpose of enabling the court to compare" do not exclude the use of such 'admitted' sample writing for comparison with the alleged writing of the accused by a handwriting expert cited as a witness by any of the parties. Even where no such expert witness is cited or examined by either party the court, may, if it thinks necessary for the ends of justice, on its own motion, call an expert witness, allow him to compare the sample writing with the alleged writing and thus give his expert assistance to enable the court to compare the two writings and arrive at a proper conclusion.

For all the foregoing reasons, we are of opinion that in passing the orders dated 20 May 1972 relating to the disposal of the application dated 11 December 1970, the learned additional district magistrate did not exceed his powers under section 73, Evidence Act. The learned judges of the High Court were not right in holding that in directing the accused by his said order dated 20 May 1972, the Magistrate acted beyond the scope of section 73 or in a manner which was not legal.

Accordingly, we allow this appeal, set aside the judgment of the High Court, and restore the order dated 20 May 1972, of the magistrate who may now repeat his direction to the accused to write down the sample writing. If the accused refuses to comply with the direction, it will be open to the court concerned to draw under section 114, Evidence Act, such adverse presumption as may be appropriate in the circumstances. If the accused complies with the direction, the court will in accordance with its order dated 20 May 1972, send the writing so obtained, to a senior Government Expert of Questioned Documents, named by it, for comparison with the disputed writing and then examine him as a court witness.[136]

10.26.41 Specimen Writing — During Police Investigation[137]

Shri OP Rana, learned counsel for the appellant contended that section 73 of the Evidence Act conferred ample power on the magistrate to direct the accused to give his specimen writing even during the course of investigation. He also urged that it would be generally in the interests of the administration of justice for the magistrate to direct the accused to give his specimen writing when the case was still under investigation, since that would enable the investigating agency not to place the accused before the magistrate for trial or enquiry, if the disputed writing, as a result of comparison with the specimen writing was found not to have been made by the accused. While we agree with Mr. Rana that a direction by the Magistrate to the accused to give his specimen writing when the case is still under investigation would surely be in the interests of the administration of justice, we find ourselves unable to agree with his submission that section 73 of the Evidence Act enables the magistrate to give such a direction even when the case is still under investigation.

Section 73 of the Evidence Act is as follows:

> **73. Comparison of signature, writing or seal with others admitted or provide.** *In order to ascertain whether a signature, writing or seal is that of the person by whom it purports to have been written or made, any signature, writing or seal admitted or proved to the satisfaction of the court have been written or made by that person may be compared with the one which is to be proved, although that signature, writing or seal has not been produced or proved for any other purpose.*

136. *State (Delhi Administration) v Pali Ram,* AIR 1979 SC 14 : 1979 Cr LJ 17 : (1979) 2 SCC 158.
137. *State of Uttar Pradesh v Ram Babu Misra*, AIR 1980 SC 791 : (1980) 2 SCC 343 : (1980) 2 SCWR 25.

> *The court may direct any person present in court to write any words or figures for the purpose of enabling the court to compare the words or figures so written with any words or figures alleged to have been written by such person. This section applies also with any necessary modifications to finger-impression.*

The second paragraph of section 73 enables the court to direct any person present in court to give specimen writings "for the purpose of enabling the court to compare" such writings with writings alleged to have been written by such person. The clear implication of the words "for purpose of enabling the court to compare" is that there is some proceeding before the court in which or as a consequence of which it might be necessary for the court to compare such writings. The direction is to be given for the purpose of "enabling the investigating or other agency to compare". If the case is still under investigation there is no present proceeding before the court in which or as a consequence of which it might be necessary to compare the writings. The language of section 73 does not permit a court to give a direction to the accused to give specimen writings for anticipated necessity for comparison in a proceeding which may later be instituted in the court. Further, section 73 of the Evidence Act makes no distinction between a Civil Court and Criminal Court. Would it be open to a person to seek the assistance of the Civil Court for a direction to some other person to give sample writing under section 73 of the Evidence Act on the plea that it would help him to decide whether to institute a civil suit in which the question would be whether certain alleged writings are those of the other person or not? Obviously not. If not, why should it make any difference if the investigating agency seeks the assistance of the court under section 73 of the Evidence Act on the plea that a case might be instituted before the court where it would be necessary to compare the writings?

We may also refer here to section 5 of the Identification of Prisoners Act, 1920, which provides:

> *If a magistrate is satisfied that, for the purpose of any investigation or proceeding under the Code of Criminal Procedure, 1898 it is expedient to direct any person to allow his measurements or photograph to be taken, he may make an order to that effect, and in that case the person to whom the order relates shall be produced or shall attend at the time and place specified in the order and shall allow his measurements or photograph to be taken as the case may be, by a police officer:*
>
> *Provided that no order shall be made directing any person to be photographed except by a magistrate of the first class:*
>
> *Provided further, that no order shall be made under this section unless the person has at some time been arrested in connection with such investigation or proceeding.*

Section 2(a) of the Act defines "measurements' as including "finger-impressions and footprint impressions".

There are two things to be noticed here. First, signature and writing are excluded from this range of section 5 of the Identification of Prisoners Act and, second, 'finger impressions' are included in both section 73 of the Evidence Act and section 5 of the Identification of Prisoners Act. A possible view is that it was thought that section 73 of the Evidence Act would not take in the stage of investigation and so section 5 of the Identification of Prisoners Act made special provision for that stage and even while making such provision, signature and writings were deliberately excluded. As we said, this is a possible view but not one on which we desire to rest our conclusion. Our conclusion rests on the language of section 73 of the Evidence Act.

Section 73 of the Evidence Act was considered by us in *State (Delhi Administration) v Pali Ram*[138] where we held that a court holding an enquiry under the Code of Criminal Procedure,

138. AIR 1979 SC 14 : 1979 Cr LJ 17 : (1979) 2 SCC 158.

was entitled under section 73 of the Evidence Act to direct an accused person appearing before it to give his specimen handwriting to enable the court to compare it with disputed writings. The present question whether such a direction, under section 73 of the Evidence Act can be given when the matter is still under investigation and there is no proceeding before the court was expressly left open. The question was also not considered in *State of Bombay v Kathi Kalu Oghad,*[139] where the question which was actually decided was that no testimonial compulsion under Article 20(3) of the Constitution was involved in a direction to give specimen signature and handwriting for the purpose of comparison.

The view expressed by us in the earlier paragraphs on the construction of section 73 Evidence Act was the view taken by the Madras High Court in *T Subbiah v SKD Ramaswamy Nadar,* AIR 1970 Mad 85 : 1969 Mad LW (Cri) 117 : 1970 Cr LJ 254, the Calcutta High Court in *Farid Ahmed v State of West Bengal,* AIR 1960 Cal 32 : 1960 Cr LJ 56 : ILR (1960) 2 Cal 60 (Mitter J. at p 32) and *Priti Ranjan Ghosh v State of West Bengal,* (1973) 77 Cal WN 865, the High Court of Punjab and Haryana in *Dharamvir Singh v State*, 1975 Cr LJ 884 : 1974 Pun LJ (Cri) 439 : 1975 Cur LJ 132 the High Court of Madhya Pradesh in *Brij Bhushan Raghunandan Prasad v State of Madhya Pradesh,* AIR 1957 MP 106 : 1957 Cr LJ 855 : ILR 1957 MP 236, the Orissa High Court in, (1972) 2 Cal WR 1332, and the in what Appeal No. Allahabad High Court in the Judgment under appeal. A contrary view was taken by the Patna High Court in *Gulzar Khan v State,* (1962) 2 Cr LJ 84 : 1962 BLJR 604 : AIR 1962 Pat 255 (FB) and the High Court of Andhra Pradesh in *B. Rami Reddy v State of Andhra Pradesh,* (1971) 2 Andh WR 94 : (1971) 2 APLJ 174 : 1971 Cr LJ 1591 (AP). "We do not agree with the latter view".[140]

10.26.42 Exemplars to be taken in Open Court[141]

Apart from the ocular evidence as stated above, the prosecution strongly relied upon the evidence of the Handwriting expert (PW-33) and also his opinion given on a comparison of the alleged signatures of the accused appearing on various TDS certificates, specimen signature cards, credit vouchers/withdrawal slips, with the admitted signatures taken from the accused. On the basis of the evidence of the expert, according to whom the signatures in the documents marked in "*Q"* series are tallying with the specimen signatures alleged to have been obtained from the accused, it is contended by the prosecution that inasmuch as the testimony of the expert clinchingly establishes that it was the accused who had fabricated the documents in question *i.e.*, T.D.S. certificates by forging the signatures of a fictitious Engineer and filing them along with Income-tax returns, the prosecution successfully proved the involvement of the accused in the commission of offence.

But, it should be borne in mind that the opinion of an expert in writing is the weakest and the least reliable evidence and that it is not at all safe to base a conviction upon the opinion of writing expert alone. Courts have refused to act upon the evidence of expert unless it is corroborated by independent evidence. In a catena of decisions, it was ruled by the Apex Court that it would be highly unsafe to convict a person on the sole testimony of an expert. Therefore, the evidence of the expert (PW-33) who deposed in court basing on the opinion given by him earlier, cannot be said to be a conclusive proof. It is so more particularly because of the fact that the said evidence is not corroborated by any independent evidence. Apart from that, as seen from the evidence on record the specimen signatures which were sent to the expert for examination were not obtained in open Court and they were obtained during the course of investigation by the C.B.I. Such an opinion based on the specimen signatures which are not taken in open Court, cannot be relied upon by the Court as it is not a valid opinion. Therefore,

139. AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).
140. *State of Uttar Pradesh v Ram Babu Misra*, AIR 1980 SC 791 : (1980) 2 SCC 343 : (1980) 2 SCWR 25.
141. *M Durga Prasad v State of Andhra Pradesh*, AIR 2004 AP 2714 : 2004 Cr L J 242

conviction cannot be based solely placing reliance on such opinion. Thus, the evidence on record is not sufficient to hold that A3, A7 and A8 have fabricated and forged the documents, as alleged by the prosecution. However, the prosecution was able to establish the guilt of A1 as he did not scrutinise the relevant file in spite of the endorsement by PW-5 for scrutiny and thereby enable A3 to obtain refund orders from him. But since the very charge against A3 is held as not proved, it is not safe to convict A1 for the said offence. Accordingly, A1, A3, A7 and A8 are acquitted of the charges under sections 465 and 471 I.P.C.

10.26.43 [142]Paper Tear Evidence Admissible

The question is, as to whether the recovery of Ex. P-57 is an incriminating evidence against the accused. The case of the prosecution is, that a sheet of paper (Ex. P-5) was torn out from this book which was marked by handwriting expert Mr. Puri (P.W. 22) as Q '2', is an important link in the case. Ex. 1 was produced to Surajmal (P.W. 1) on April 28. It is in Roman English and reads, *"Wada Pura Nahin Lash Hotel Kay Ass Pass"*. According to Krishan Gopal (P.W. 3), Ex. P-5 was found lying in the lawns of his house. He resides along with his brother, Mahavir Prasad, father of deceased Rajesh, in Amba Bari, Jaipur. Though the authorship of Ex. P-6 has not been proved to be of the accused, but, as we shall presently show it can be said on the material on record that the sheet of paper (Ex. P-5) was torn out from the practical copy (Ex. P-57) which was recovered from the possession of the accused on his information under section 27 of the Evidence Act, from nowhere else but from the house of the accused. Though, apart from the fact that the name of Miss Seema is written on Ex. P-57 there is no other evidence that Ex. P-57 is in any way connected with the crime, and is a piece of substantial evidence against the accused. Mr. Frank Anthony, the learned advocate for the accused, in support of his submission that the statement of Mr. Puri (P.W. 22) handwriting expert to the effect that the sheet (Ex.P-5) was torn out from the other part of the sheet marked B-18 is not an expert opinion within the meaning of section 45 of the Evidence Act, has referred to *Hanumant Govind v State of Madhya Pradesh,*[143] in which it has been held that opinion of expert that a particular letter was typed on particular machine does not fall within the ambit of section 45 and is inadmissible, this ruling will not apply to the present case, because, here we are not dealing with the question as to whether a typed material was typed on a particular type machine, but we are dealing as to whether the sheet of paper (Ex. P-5) was torn out from Ex. P-57 exercise book. We are of the opinion that the question as to whether the paper on which a document is written has been torn out from a copy is an expert opinion. Under section 45 of the Evidence Act, when the court has to form an opinion upon a point of science, the opinion on that point of persons specially skilled in such science is a relevant fact. In "Websters' Dictionary" "Science" has been defined as possession of knowledge as distinguished from ignorance. Knowledge is acquired through study and practice. In journal published by the Forensic Science Society in July, 1980 (Vol 20) at p 149 dealing with Broader Basis of Forensic Science, it has been dealt as to what type of information is produced by forensic scientist. It is (1) information to help in the decision on whether a crime has been committed; (2) corroborative evidence of (1) and (3) evidence to incriminate or eliminate an individual. It has been observed: "The adjective Forensic which goes back to Roman times, means "related to, used in or connected with a court of law". Forensic science is, therefore, science used in connection with a court of law. The application of science to the apprehension and conviction of criminals is only part of the whole field of science applied in this way." Thus, to our mind the evidence as to whether a paper which contains incriminating material against the accused has been torn out from another copy is an information connected with the forensic science. Wilson R Harrison in his book *"Suspected Documents"* at p 43 has said:

142. 1981 Cr LJ 1253.
143. AIR 1952 SC 343 : (1952) SCR 1091 : 1952 SCJ 509.

If the edge of a suspect document is seen to be irregular, an accurate record of its outline should be preserved, as it may prove possible to match this irregular edge with that another document which subsequently comes to hand. Evidence such as this has no occasion proved to be a value when anonymous letters are being investigated, for these are often written on scraps of paper torn from sheets which later become available to the investigators.

At the same page (bottom), the author dealing with "perforations" has said:

Paper rarely tears evenly along the performations[sic]. The slight irregularities in tearing may prove of value should it be required to prove that a sheet was torn from a particular counterfoil.

The author at p 44 under Fig. 3-10 while explaining has said:

An enlarged photograph (2X) provides the best evidence of matching through the uneven tearing of perforation.

Fluorescence is one of the items to be observed in the examination and comparison of paper. The same author dealing with "The fluorescence of paper" has observed at p 90:

The exposure of paper to ultraviolet light is a useful test when a document consists of several pages and the substitution of one or more is suspected. The forger may be able to match the general colour and appearance of an unwater-marked sheet as viewed under ordinary conditions of lighting, but unless a very similar paper has been chosen, it is unlikely to exhibit the same fluorescence in ultra-violet light.

The pages of any suspect document should be exposed side by side and their fluorescence compared: no decision should be made until both sides of all the sheets have been examined, for the back and front surfaces may differ in their fluorescence. With a single page document, the actual colour of the fluorescence may have little significance, so that the attention should be concentrated on the discovery of places where there is some modification of either colour or intensity, for these may well be the sites of erasures.

Osborn in his book, *"Questioned Documents"* (Second Edn) chapter XXVI dealing with paper and Questioned documents has observed:

It has been conclusively shown that several questioned documents or widely different dates were all written on paper that originally formed one sheet, as was clearly proved by the matched indentations on the edges of the several pieces where they had been torn apart. The sheet of paper on which an anonymous letter was written has been shown to have come from a blank book from which it had been torn, which book had been in the possession of one who was accused of writing the letter.

Thus, we are of the opinion that it is possible for an expert, if he is one to examine and say, as to whether a sheet of paper on which the questioned document is written came from a particular copy or not. No doubt, in order to establish the identity of the papers, on the questioned as well as the others in the blank copy, from which the sheet, from which the questioned document is said to have been torn out, the colour, thickness, finish or surface, watermark, wove or laid style, cutting, size, ruling, fluorescence have to be looked into. But, it does not appear to be necessary that before the identity of the two papers can be established, all the aforesaid things must be similar, and in a given case only some of the things may enable the expert to give an opinion about the identity of the two papers.

Mr. Puri (P.W. 22), the expert, is working as an Assistant Director (Documents) in the New State Forensic Science Laboratory, Rajasthan, since June 1959. He has stated that he is an expert of handwriting and other alleged problems and also received training prior to his appointment in the Punjab CID Scientific section, Phillaur, Bihar Police Laboratory, Patna, Indian Security Press, Nasik and Government of India Mint, Calcutta for over one and a half years. In the year 1971, he also received advance training in the subject in the Home Office Forensic Science Laboratory at Cardiff in UK for a period of about six months, having been sponsored by Government of India. He has stated that the page containing disputed writing

marked "Q 2" (Ex. P-5), the reverse side of which is marked "Q 2" (R) was removed from the note book marked "B" from the place opposite to page B-18 (R). He opined that the edges of the side, which was pulled marked "Q 2" (R) match with the relevant edges of the pages B-18 (R). He prepared a comparison chart marked Ex. P-148, which also contains enlarged photographs. He had examined the documents "Q 2" (R), (Ex. P-5) and B-18 (R) (Copy Ex. P-57) by placing them side by side of the paper B-18 (R) is the reverse side. We are, therefore, of the opinion that on the evidence of Mr. Puri it can be said that the sheet on which Ex. P-5 was written was taken out from Ex. P-57, and the other sheet of it is B-18 (R). We have already reproduced as to what is written in Ex. P-5 and we are of the opinion that it is an incriminating evidence, and the fact that the copy from which the sheet on which Ex. P-5 was torn was recovered on the information of the accused at his instance from his house, connects the accused with the crime.[1]

10.26.44 Incomplete Evidence[144]

Dr. BR Sharma (P.W. 22) undoubtedly had the qualifications of an expert, although he had not published any paper with regard to the comparison and identification of printed matters. But his evidence, even if admissible, does not necessarily lead to the conclusion that the number on the ticket Ex. P-3, was forged, and not printed in due course on any of the eight machines on which the numbers of the lottery tickets for the Third Draw were printed. Only three Exhibits were sent to Dr. Sharma for examination and comparison. They were:

(i) One Haryana State Lottery ticket marked "A" allegedly produced by Sh. Kanti Lal;

(ii) One genuine ticket produced by Sh. G.S. Kale which is Ex. P-l;

(iii) One allegedly forged ticket which is Ex. P-3. The further circumstance that robbed his evidence of determinative value was that his opinion was invited only on the narrow point whether these three tickets were printed with the same printing machine. The witness examined these tickets and answered the reference in the negative. Reasons in support of his opinion are mentioned in his report (Ex. PAB). In cross-examination, however, Dr. Sharma stated that he was required to compare the marks (the number) on the ticket (Ex. P-l) with the machine (Ex. P-10) and therefore, the establishment of individual characteristics of the machines was neither possible nor necessary. For such identification, the witness added:

"We need a number of machines to establish the individuality of the machines with reference to other machines." The witness further conceded:

"I did try to find out data in the letter *X* to give a definite opinion either in positive or negative form. There can be slight differences in the dimensions of the letters and digits due to the proper and improper inking. I could not find significant differences which could permit to say that the letter *X* was not printed with the letter-face, which was sent to me on Ex. P-l and Ex. P-21. I did not compare the letter *X* on Exs. P-l and P-3 *inter se* as it would not have served any useful purpose, nor I was required to so do. In this case it was not possible to give a definite opinion on the printing of letter *X* as it was a single letter."

He further stated that he had not compared the inks on Ex. P-l and Ex. P-3, and therefore, could not say whether there was or not any difference in the inks used in printing the numbers on these tickets. Thus, Dr. Sharma's opinion on his own showing could not be definite and conclusive. P.W. 6 and P.W. 12 revealed that the numbers on the tickets relating to the Third Draw were printed in the Thompson Press on eight different machines and not only on the

144. *Chatt Ram v State of Haryana*, AIR 1979 SC 1890 : (1979) Cr LJ 1411 : 1979 Cri LR (SC) 590.

machine (Ex. 10) which alone was examined by Dr. Sharma in relation to the three tickets sent to him. Thus, Dr. Sharma's evidence did not clinch the issue as to whether the ticket Ex. P-3 was a forged one.

The last witness in this set is Joginder Singh Overseer (P.W. 26). He was the supervisor of the Lotteries Department of Thompson Press in which the lottery tickets were printed. He examined the four tickets in question, each bearing No. X-78410, on 8 December 1969, including Ex. P-l and Ex. P-3. In his opinion, Ex. P-l (which was the ticket produced by Shri G.S. Kale), was genuine for the following reasons:

1. The series type *X* corresponds to the genuine type face in Chalthenem 18, condensed bold.
2. Movement of the digits on the ticket is similar to the movement of the digits of machine No. 386008 of Tutilo numbering machine, made in Germany and which is available with the Thompson Press, Faridabad.
3. The numbering of counterfoils produced is similar to the genuine numbering machine. It was printed by a Machine No. 386012 of Tutilo number machine made in Germany and which is available in Thompson Press, Faridabad.
4. The space between No. and alphabets is same on the ticket and the counterfoil.
5. Type of series are same on the ticket and counterfoil, *i.e.,* Chalthenem 18, Bold Condensed.
6. Inking of ticket is genuine, *i.e.,* with densed black.

The witness further opined that the ticket (Ex. P-3) is not genuine for these reasons: —

1. Ink shade is not the same in the genuine ticket, *i.e.,* Ex. P-l.
2. Distance between No. and *X* is a little more.
3. There is no alignment with *X* and slanting position."

In cross-examination, the witness revealed that he had ample training regarding the comparison of printed disputed documents and had written an article entitled "Detection on Forgeries in Printed Material". The witness admitted that in (Ex. P-3) the type face is also from 'CHALITHENEM) 18 bold condensed but it is from a brand-new type face. The witness conceded:

> *It is possible that numbering of Ex. P-3 was done with Tutilo machine rather it was printed with a Tutilo make machine. It is true that the size of the type of spacing of the digits were the same in Exs P-1 and P-3. We used dense black ink in our printing the tickets while this ink was not in Ex. P-3 but they were not of the same shade although both were black.*

The witness added that he had examined the ink shades with a magnifying glass and found that while the ink used in Ex. P-l was of their press, it was not so in the cases of the other three tickets. The witness, however, did not perform any chemical test to ascertain the identity of the ink.

Assuming arguendo, that Joginder Singh had the necessary skill, scientific knowledge and experience of an 'expert' and his opinion was admissible under section 45, then also it would be highly unsafe to condemn Ex. P-3 on his opinion alone, as a forged document. The dissimilarities between Ex. P-1 and Ex. P-3 on the basis of which he has characterised the number on Ex. P-3 as a forged number, may be natural variations. His opinion does not indubitably exclude the possibility of the number in question on Ex. P-3 having been printed in the ordinary course on one of the eight Tutilo machines of the Thompson Press. In cross-examination, he did not rule out this possibility. His opinion that the questioned number on Ex. P-3 had not been printed with the same ink with which the number on Ex. P-l and the

other lottery tickets were printed in their press cannot pass muster. The only reason for this difference in the printing ink given by him, is that the ink used in printing the questioned number on Ex. P-3 is less dense or lighter in shade than that of Ex. P-l. Thus, variation in density of ink may be due to an innocuous cause. The witness never examined the ink chemically. This circumstance pointed out by the witness was too precarious to be a safe basis for a finding of forgery.

Even if it is assumed for the sake of argument that the number on Ex. P-3 had been forged, that by itself would not show that Chatt Ram, appellant forged it or participated in its forgery. Nor would the mere fact that Chatt Ram presented this ticket before the officers concerned and claimed the special prize on knowledge or belief of its forged character.

Nor where the two circumstances pointed out by the counsel for the state such as would unerringly raise an inference that the appellant possessed the *mens rea* requisite for an offence concerned for claiming the special prize. These two circumstances (which have been set out in a foregoing part of this judgment), at the most, raise suspicion about the requisite guilty knowledge or belief on the part of the appellant. But suspicion is no substitute for proof.

To sum up, even if the evidence of P.Ws. 6, 12, 22 and 26 were assumed to be admissible under section 45, Evidence Act, it was not sufficient to establish beyond reasonable doubt that the ticket Ex. P-3 was a forged document. Further, even on the assumption that the ticket Ex. P-3 was a forged document, the evidence on the record did not indubitably lead to the conclusion that the appellant Chatt Ram was concerned in forging it or had the requisite guilty knowledge of its forged character when he presented it and claimed prize on its basis before the officers concerned. It is immaterial if at any subsequent point of time he came to know of its forged character.

Since, in any event, the evidence on the record is insufficient to sustain the conviction of Chatt Ram appellant under sections 467, 471 Indian Penal Code the legal question posed by the High Court is rendered wholly academic and it is not necessary to decide the same for the purpose of this appeal.[1]

10.26.45 Refusal to Give Specimen — Contempt of Court[145]

With the introduction of such "requested" specimens in criminal cases, questions regarding possible self-incrimination in violation of the Fifth Amendment of the United States Constitution arose. These matters were effectively dealt with by the Supreme Court in two separate decisions in recent years. In *Scherber v California,* 384 US 757 : 86 S. Ct. 1826 (1966) the defendant argued that the taking of blood specimen to determine alcohol content, over his objection, was a violation of his privilege against self-incrimination. The court held that while the Fifth Amendment does protect an individual from being compelled to testify against himself, the taking of his blood did not involve testimonial compulsion. The court touched upon our field by stating that the Fifth Amendment privilege did not afford protection against compulsion to "Submit to fingerprinting, photographing, or measurements, to write or speak for identification".

Handwriting specimens were more directly involved in a decision rendered the following year in *Gilbert v California,* 388 US 263 (1967). The defendant provided handwriting specimens to federal agents in connection with federal offences, and these specimens were subsequently used to prosecute him on local charges. He argued that such use was in violation of his privilege against self-incrimination. The court rejected this contention and held that "a

145. *EF Afford Jr. and Ronald M Dick*, *International disguise in court-ordered handwriting specimens*, Journal of Police Science and Administration, 6 (4), 420, (1978).

mere handwriting exemplar, in contrast to what is written, like the voice or body itself, is in identifying physical characteristic outside its protection.

The introduction of such handwriting specimens also provoked questions concerning possible violations of privileges against unreasonable searches and seizures as provided by the Fourth Amendment. The Supreme Court has also dealt with this question in recent years. In *United States v Mara*, 10 Cri L 2235 (7th Cir), 1971 the court held that:

> Handwriting, like speech, is repeatedly shown to the public, and there is no more expectation of privacy in the physical characteristics of a person's script than there is in the tone of his voice.

The decisions cited clearly reflect the attitude of the Supreme Court that the introduction of requested handwriting specimens does not involve violations of privileges provided by the Fourth and Fifth Amendments.

The Schmerber decision, in holding that the Fifth Amendment privilege did not afford protection against compulsion to write for identification purposes, is a far cry from the early rulings that specimens had to be in the case for some other purpose. It can be looked upon as a landmark decision in that it has paved the way for compelling a person to provide handwriting specimens through a court order or grand jury proceedings. This has led to the common practice today of securing court-ordered specimens, and courts have held the failure to provide such specimens constitutes contempt. Additionally, some courts have held that providing specimens that are deliberately disguised also provides ground for contempt proceedings. Some periphery procedures that have evolved have yet to be ruled upon by the higher courts. An example is a recent complimentary ruling by a trial judge in New Orleans that because handwriting experts are also so accurate now, it is an infringement of the individual's rights to have him repeat the pertinent material letter for letter.[1]

10.26.46 Evidentiary Value[146]

The opinion of a handwriting expert, even if it may be said to be of reliable nature, is not conclusive on the point that the signatures alleged to have been forged, were really made by the accused. The opinion of the expert is only corroborative and not a substantive piece of evidence.[2]

10.26.47 Magistrate as Handwriting Expert[147]

Where the magistrate after considering the opinion of handwriting expert compared the writing on the forged document and the subsequent writings of the accused and came to the conclusion that the document was forged, it was held that he ought not to have taken the role of an expert. His opinion was certainly influenced by the opinion of the expert. He did not discuss how he could come to his belief on simply seeing the handwriting on the forged document and the specimen handwriting of the accused. If he wanted to rely upon his own knowledge, he ought to have given his own reasons why he thought that the forged document was in the hand of the accused. If he had any independent expert knowledge about the handwriting he ought to have given reasons for his belief independently according to his own knowledge. In the absence of such reasons the decision of the magistrate was held not justified.

146. (1978) Cr LJ (NOC) 194.
147. (1978) Cr LJ (NOC) 128 (Cal).

10.26.48 Counterfeiting Currencies[148]

"Counterfeiters all over the world must be singing in ecstasy, if there is heaven on earth, it is here, here, here", for, according to the Kerala High Court Indian law does not make counterfeiting of currency notes of any country in the world, other than that of India, an offence.

The High Court has persuaded itself by a process of judicial activism in reverse gear, that making of such counterfeit notes is not an offence under section 489A of the Indian Penal Code and that having in possession such counterfeit currency notes is not an offence under section 489C of the Indian Penal Code. Such a view has been taken even though there is nothing in the language of these sections to warrant such an interpretation as will become evident presently.

Facts.—The six respondents herein were charged with offences punishable under sections 120B, 489A, 489B and section 420 read with sections 51 and 34, Indian Penal Code. The prosecution case against them was that in furtherance of a conspiracy entered into by accused Nos. 1 to 4 to forge and counterfeit American Dollar notes of 20 dollar denomination, they indulged in counterfeiting by printing 2000 such notes. Respondents 1 and 2 were further alleged to have been in possession of 148 forged currency notes knowing the same to be forged, with intent to use these forged notes as genuine. The respondents were committed by the Magistrate to stand their trial before the Sessions Court, for offences under sections 120B, 489A and 489C read with sections 511 and 34, Indian Penal Code. It was contended by the respondents accused before the Sessions Court that a charge under sections 489A and 489C of the Indian Penal Code could be lawfully levelled only in the case of counterfeiting of 'Indian' currency notes and not in the case of counterfeiting of "foreign" currency notes. The contention was upheld by the Sessions Court at the threshold of the trial and the accused were discharged. Aggrieved by the order of the Sessions Court discharging the respondents, the petitioner (State of Kerala) filed a Revision Petition before the High Court of Kerala. The High Court by its order under appeal confirmed the order of discharge rendered by the Sessions Court holding that "in the absence of an explanation similar to that in the case of bank notes, section 489A and the sections that follow which relate to counterfeiting of currency notes do not apply to cases of counterfeiting of dollar bills". The petitioner thereupon filed an application under Article 134(1)(c) of the Constitution for leave to appeal to the Supreme Court. By its order under appeal, the High Court certified it as a fit case for appeal to the Supreme Court as "the case involves considerably important questions of law as to whether counterfeit American dollar notes will fall within the purview of sections 489A and 489C of the Indian Penal Code." That is how the matter has come up before this court.

Relevant Provisions.—The anatomy of the relevant provisions requires to be X-rayed at the outset. The concerned provisions may, therefore, be screened:

> **[[s 489A] Counterfeiting currency-notes or bank-notes.** Whoever counterfeits, or knowingly performs any part of the process of counterfeiting, any currency-note or bank-note, shall be punished with [149][imprisonment for life], or with imprisonment of either description for a term which may extend to ten years, and shall be liable to fine.
>
> Explanation.—For the purposes of this section and of sections 489B, [150][489C, 489D and 489E] the expression "bank note" means a promissory note or engagement for the payment of money to bearer on demand issued by any person carrying on the business

148. Judgment and Order rendered by the Kerala High Court in Cr LJ 263 of 1975 on November 17, 1976, giving rise to the present appeal by certificate of fitness under article 134(c) of the Constitution of India.
149. Subs. by Act 26 of 1955, section 117 and Schedule, for "transportation for life" (w.e.f. 1-1-1956).
150. Subs. by Act 35 of 1950, section 3 and Sch II, for "489C and 489D".

of banking in any part of the world, or issued by or under the authority of any State or Sovereign Power, and intended to be used as equivalent to, or as a substitute for money.]

[[s **489C] Possession of forged or counterfeit currency-notes or bank-notes.** Whoever has in his possession any forged or counterfeit currency-note or bank-note, knowing or having reason to believe the same to be forged or counterfeit and intending to use the same as genuine or that it may be used as genuine, shall be punished with imprisonment of either description for a term which may extend to seven years, or with fine, or with both.]

Analysis.—An analysis of section 489A reveals that:

(i) counterfeiting "any" currency note or bank-note is an offence;

(ii) knowingly performing any part of the process of counterfeiting any currency note or bank-note is also an offence; and

(iii) the prohibition against counterfeiting or performing such process applies to currency notes as also to bank-notes as defined by the *explanation* to section 489A. And inasmuch as the aforesaid *explanation inter alia* means any engagement for the payment of money to the bearer issued by or under the authority of any State or sovereign power provided it is intended to be used as equivalent to or substitute for money the prohibition also extends to counterfeiting,, of currency notes of any other sovereign power.

Outcome.—This analysis reveals that the legislative embargo against counterfeiting envelops and takes within its sweep "currency notes" of all countries. The embargo is not restricted to "Indian" currency notes. The Legislature could have, but has not, employed the expression "Indian currency note. If the legislative intent was to restrict the parameters of prohibition to "Indian currency" only, the Legislature could have said so unhesitatingly. The expression "currency note" is large enough in its amplitude to cover the currency notes of "any" country. When the Legislature does not speak of currency notes of India the court interpreting the relevant provision of law cannot substitute the expression "Indian currency note" in place of the expression 'currency note' as has been done by the High Court. The High Court cannot do so for the court can merely interpret the section; it cannot re-write, recast or redesign the section. In interpreting the provision, the exercise undertaken by the court is to make explicit the intention of the Legislature which enacted the legislation. It is not for the court to reframe the legislation for the very good reason that the powers to "legislate" have not been conferred on the court. When the expression "currency note" is interpreted to mean "Indian currency note", the width of the expression is being' narrowed down or cut down. Apart from the fact that the court does not possess any such power, what is the purpose to be achieved by doing so? A court can make a purposeful interpretation so as to 'effectuate' the intention of the Legislature and not a purposeless one in order to "defeat" the intention of the legislators wholly or in part. When the court (apparently in the course of an exercise in interpretation) shrinks the content of the expression "currency note", to make it referable to only "Indian currency note", it is defeating the intention of the Legislature partly inasmuch as the court makes it lawful to counterfeit notes other than Indian currency notes. The manifest purpose of the provision is that the citizens should be protected from being deceived or cheated. The citizens deal with the transact business with each other through the medium of currency (which expression includes coins as also the paper currency that is to say currency notes). It is inconceivable why the Legislature should be anxious to protect citizens from being deceived or cheated only in respect of Indian currency notes and not in respect of currency notes issued by other sovereign powers. The purpose of the legislation appears to be to ensure that a person accepting a currency note is given a genuine currency which can be exchanged for goods or services and not a worthless piece of paper which will bring him nothing in return, it being a counterfeit or a forged

currency note. Would the Legislature in its wisdom and anxiety to protect the unwary citizens extend immunity from being cheated in relation to Indian currency notes but show total unconcern in regard to their being cheated in respect of currency notes issued by any foreign State or sovereign power? In the modern age a tourist from a foreign country may bring from his own country into Indian currency to the extent permissible under the law in India. So also, he may obtain foreign currency in exchange of Indian currency whilst in India provided he does so to the extent permissible by the Foreign Exchange Regulation Act, 1973.[151]

10.26.49 Specimen Signatures in Open Court[152]

The first respondent remained *ex-parte* and the second respondent contended before the trial court that he was a party to the transaction and that he had not executed any letter of guarantee. According to him he accompanied the first respondent to the appellant bank with a salary certificate and that he had not signed any document. Thus, according to him the alleged deed of guarantee was only a forged one. Thus, he denied the liability to pay the amount as claimed in the plaint.

After framing necessary issues, the trial court examined P.W. 1 and D.W. 1 and marked Exits. A-1 and A-12. After hearing both sides the lower court considered the matter and held that the second respondent was not liable. Thus, the suit was decreed only against the first respondent with costs. As the liability of the second respondent was exonerated, this appeal is filed to the plaintiff bank.

Counsel for both sides was heard. According to the learned counsel appearing for the appellant the second respondent is also liable for the suit claim in view of the letter of guarantee. In view of the fact that D.W. 1 admitted his signature in Ext. A-12 acknowledgement and in view of the fact that no reply notice was sent by the second respondent, it was argued that the second respondent was liable in view of Ex. A-6 deed of guarantee executed by the second respondent on 6 August 1979. It was also argued that the lower court was not correct in holding that the signature of the second respondent differs from the admitted signatures. It was also argued that the lower court should not have compared the signatures without calling an expert's opinion. Thus, the point arising for consideration is as to whether the lower court was correct in exonerating the liability of the second respondent.

The first respondent was drawing amounts from the appellant Bank at MG Road Branch, Trivandrum under cash credit facility for the purpose of his textile firm called Sajitha Textiles. Ext. A-1 is the pronote and Ext. A-2 is the deed of hypothecation executed by the first respondent for an amount of Rs 20,000 on 12 August 1978, Ext. A-3 was the letter of guarantee executed by the second respondent on 12 August 1978. When the amount came to Rs 30,000 Ext. A-4 fresh pronote was executed by the first respondent and Ext. A-5 agreement of hypothecation was executed afresh by the first respondent on 6 August 1979. Ext. A- 6 is the fresh agreement of guarantee executed by the second respondent on 6 August 1979. Later when the amount came to Rs 40,000 the first respondent executed Ext. A-7 pronote and Ext. A-8 agreement of hypothecation on 22 April 1981. The first respondent did not contest the suit. Thus, he has admitted his liability. But the second respondent contended that he had not executed Exts. A-3 and A-6 agreement of guarantee. On a perusal of the signatures in Exts. A-3 and A-6 with that of the admitted signature in the summons and *vakalatnama*, the lower court held that the signatures differ. Thus, the lower court exonerated the liability of the second respondent. The case of the second respondent was that he went along with the

151. *State of Kerala v Verghese*, AIR 1987 SC. Also see *M Durga Prasad v State of Andhra Pradesh,* 2004 Cr LJ 242 : 2003 (2) Andh LD (Cr) 545 (AP).
152. *New Bank of India v Sajitha Textiles*, AIR 1997 Ker 201 : 1997 (1) BC 620 : 1998 (35) Bank LJ 345.

first respondent to the plaintiff bank along with Ext. A-9 salary certificate and that he did not sign any documents. In view of the denial of the signature, the burden of proof was on the plaintiff to prove that the signature in Exts. A-3 and A-6 were that of the second respondent. In the absence of an expert opinion it was only just and proper on the part of the lower court to compare the signatures with the admitted signature. Thus, the lower court held that the signatures differ in Exts. A-3 and A-6 from the admitted signatures of the second respondent. As the expert's opinion was not called for at the instance of the plaintiff, the learned counsel appearing for the appellant was not justified in blaming the lower court for comparing the signature with the admitted signature. It is true that reasons were not stated by the lower court to show how the signatures differ. Even if Exts. A-3 and A-6 were signed by the second respondent, it is to be noted that Ext. A-6 was dated 6 August 1979, whereas Ext. A-3 is of an earlier date, *i.e.,* 12 August 1978. Under section 73 of the Indian Evidence Act the court can compare the signature on the disputed documents with the admitted signatures. The learned counsel appearing for the appellant argued that the lower court ought to have directed the second respondent to put his signature on a blank paper in open court and then ought to have compared the signature with the admitted signature. But in view of the admitted signature in Ext. A-12 acknowledgement summons and *Vakalatnama*, there was no necessity to get a further signature of the second respondent in open court. Further, to prove signature under section 73 of the Indian Evidence Act, to get a signature of the second respondent in open court was only directory and it was not mandatory. When the court is satisfied that there are admitted signatures of the second respondent available in court, there was no necessity to get another signature of the second respondent in open court.

Even if Ext. A-6 is the letter of guarantee executed by the second respondent the suit ought to have been filed within the period of three years from the date of Ext. A-6. Ext. A-6 is dated 6 August 1979 and the suit is not filed against him within the period of three years from 6 August 1979. The period of limitation is three years coming under Article 55 of the Limitation Act. The decision reported in *United Commercial Bank v BM Mahadeva Babu,*[153] held that the suit against the guarantor for enforcement of guarantee should be filed within the period of three years from the date of guarantee as the period of limitation is as prescribed by Article 55 of the Indian Limitation Act. As the suit was not filed within the period of three years from the date of Ext. A-6, the appellant cannot enforce the guarantee against the second respondent. For that reason, the appellant cannot get a decree against the second respondent. In this context the learned counsel appearing for the appellant argued that the question of limitation was not taken up by the second respondent in his written statement or before the lower court. But a question of law can be taken up even before the appellate court. Thus, it is futile to contend that the question of limitation cannot be urged by the second respondent before this court. Under Article 55 of the Indian Limitation Act the period fixed is three years. Thus, as the suit was not filed within the period of three years from the date of Ext. A6, the second respondent is not liable for the suit claim. Thus, I do not find any reason to interfere with the judgment and decree of the lower court.

For the above reasons the judgment and decree of the lower court are confirmed, and this appeal is dismissed. In the peculiar circumstances, both parties are to bear their costs.[154]

153. AIR 1992 Ker 294.
154. *New Bank of India v Sajitha Textiles*, AIR 1997 Ker 201 : 1997 (1) BC 620 : 1998 (35) Bank LJ 345.

10.26.50 Indefinite Expert Opinion[155]

Since, the appellant has denied the authorship of those letters and claimed that the same have been fabricated, it was desirable for the prosecution to examine Ms. Vani in connection with those letters. The appellant is alleged to be the author of the letters more particularly letters E. P-l, P-6, P-7 and P-9. From the opinion of P.W. 3, the handwriting expert, the prosecution has sought to corroborate the evidence of P.W. 1 regarding the authorship of those letters. The opinion of P.W. 3, the Assistant Director in the State Forensic and Science Laboratory, Hyderabad, in our view cannot be said to be of a clinching type to attribute the authorship of those letters to the appellant. P.W. 3 during his statement deposed:

> *In my opinion (1) there are similarities indicating common authorship between the red enclosed writings marked as section 12 to section 23 and the red enclosed writings marked as Q-4 to Q-7. But no definite opinion can be given on the basis of the present standards. (2) No opinion can be given on the authorship of the red enclosed signatures and -writings marked as Q-1 to Q-3 and Q-8 to Q-15 on the basis of present standards.*

The expert further opined:

> *When all the writing characteristics are considered collectively, they led to the conclusion that there are similarities indicating common authorship between the standard writings marked S-12 to S-25 and the questioned writings marked Q-4 to Q-7. But no definite opinion can be given on the basis of the present standards. Extensive admitted writings are required for offering a definite opinion.*

During his cross-examination P.W. 3 admitted:

> ***Question.*** *From the available standards you cannot say that the signatures of Exs. P-7 and P-9 is of the same person who wrote Exs. P-7 and P-9.*
>
> ***Answer.*** *We can compare truly like signatures with signatures and writings with writings and not a signature with writing.*

Thus, the evidence of P.W. 3, is not definite and cannot be said to be of a clinching nature to connect the appellant with the disputed letters. The evidence of an expert is a rather weak type of evidence and the courts do not generally consider it as offering 'conclusive' proof and, therefore, safe to rely upon the same without seeking independent and reliable corroboration. In *Magan Bihari Lal v State of Punjab,*[156] while dealing with evidence of a handwriting expert, this court opined (at p 1093):

> *We think it would be extremely hazardous to condemn the appellant merely on the strength of opinion evidence of a handwriting expert. It is now well-settled that expert opinion must always be received with great caution and perhaps none so with more caution than the opinion of a handwriting expert. There is a profusion of precedential authority which holds that it is unsafe to base a conviction solely on expert opinion without substantial corroboration. This rule has been universally acted upon and it has almost become a rule of law. It was held by this court in* Ram Chandra *v* State of Uttar Pradesh,[157] *that it is unsafe, to treat expert handwriting opinion as sufficient basis for conviction, but it may be relied upon when supported by other items of internal and external evidence. This court again pointed out in Ishwari Prasad Mishra v Md Isa, AIR 1963 SC 1728, that expert evidence of handwriting can never be conclusive because it is, after all, opinion evidence, and this view was reiterated in Shashi Kumar v Subodh Kumar*[158] *where it was pointed out by this court that expert's evidence as to handwriting being opinion evidence can rarely, if ever, take the place of substantive evidence and before acting on*

155. *S Gopal Reddy v State of Andhra Pradesh,* AIR 1996 SC 2184 : 1996 Cr LJ 3237 : 1996 AIR SCW 2803.
156. AIR 1977 SC 1091 : (1977) 2 SCC 210 : 1977 Cr LJ 711.
157. AIR 1957 SC 381 : 1957 Cr LJ 559.
158. AIR 1964 SC 529.

such evidence, it would be desirable to consider whether it is corroborated either by clear direct evidence or by circumstantial evidence. This court had again occasion to consider the evidentiary value of expert opinion in regard to handwriting in Fakhruddin v State of Madhya Pradesh,[159] *and it uttered a note of caution pointing out that it would be risky to find a conviction solely on the evidence of a handwriting expert before acting upon such evidence, the court must always try to see whether it is corroborated by other evidence, direct or circumstantial.*

We are unable to agree, in the established facts and circumstances of this case, with the view expressed by the courts below that P.W. 1 is a competent witness to speak about the handwriting of the appellant and that the opinion of P.W. 3 has received corroboration from the evidence of P.W. 1. P.W. 1 admittedly did not receive any of those letters. He had no occasion to be familiar with the handwriting of the appellant. He is not a handwriting expert. The bald assertion of P.W. 1 that he was "familiar" with the handwriting of the appellant and fully "acquainted" with the contents of the letters, admittedly not addressed to him, without disclosing how he was familiar with the handwriting of the appellant, is difficult to accept. Section 67 of the Evidence Act enjoins that before a document can be looked into, it has to be proved. Section 67, of course, does not prescribe any particular mode of proof. Section 47 of the Evidence Act which occurs in the chapter relating to "relevancy of facts" provides that the opinion of a person who is acquainted with the handwriting of a particular person is a relevant fact. Similarly, opinion of a handwriting expert is also a relevant fact for identifying any handwriting. The ordinary method of proving a document is by calling as a witness the person who had executed the document or saw it being executed or signed or is otherwise qualified and competent to express his opinion as to the handwriting. There are some other modes of proof of documents also as by comparison of the handwriting as envisaged under section 73 of the Evidence Act or through the evidence of a handwriting expert under section 45 of the Act, besides by the admission of the person against whom the document is intended to be used. The receiver of the document, on establishing his acquaintance with the handwriting of the person and competence to identify the writing with which he is familiar, may also prove a document. These modes are legitimate methods of proving documents but before they can be accepted, they must bear sufficient strength to carry conviction. Keeping in view the inconclusive and indefinite nature of the evidence of the handwriting expert P.W. 3 and the lack of competence on the part of P.W. l to be familiar with the handwriting of the appellant, the approach adopted by the courts below to arrive at the conclusion that the disputed letters were written by the appellant to Ms. Vani on the basis of the evidence of P.W. 1 and P.W. 3 was not proper. The doubtful evidence of P.W. 1 could neither offer any corroboration to the inconclusive and indefinite opinion of the handwriting expert P.W. 3 nor could it receive any corroboration from the opinion of P.W. 3. We are not satisfied, in the established facts and circumstances of this case, that the prosecution has established either the genuineness or the authorship of the disputed letters allegedly written by the appellant from the evidence of P.W. 1 or P.W. 3. The courts below appear to have taken a rather superficial view of the matter which relying upon the evidence of P.W. 1 and P.W. 3 to hold the appellant guilty. We find it unsafe to base the conviction of the appellant on the basis of the evidence of P.W. 1 or P.W. 3 in the absence of substantial independent corroboration, internally or externally, of their evidence, which in this case is totally wanting.[160]

10.26.51 Judge as Handwriting Expert[161]

The entire set of charges against the accused, including the conspiracy charge, basically rest on the documentary evidence. To that extent, the first necessary ingredient is that the

159. AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.
160. *S Gopal Reddy v State of Andhra Pradesh,* AIR 1996 SC 2184 : 1996 Cr LJ 3237 : 1996 AIR SCW 2803.
161. *Vishwanath Mahadev Karkhanis v State of Maharashtra,* 1991 Cr LJ 3146 (Bom) : 1992 (1) All Cr LR 162 : 1991 (2) Bom CR 565.

incriminating documents in question which are attributed to the accused must be held to have been proved. This proof involves the identity and proof of the handwriting and more importantly identity and proof of the signatures. As far as both these aspects are concerned, it is pointed out by Mr. Nakhwa that there is a serious lacuna in the present investigation. He stated that there was no difficulty whatsoever for the Central Bureau of Investigation to have obtained admitted handwritings and signatures of the accused which was for some reason never done. At a very late stage, obviously after the investigation was more or less complete, it did apparently occur to the concerned authorities that it was necessary to fix the identity of the documents and their nexus with the concerned accused who had been placed on trial. For this purpose, the prosecution adopted a wholly unsatisfactory procedure and a strange one. A host of witnesses have been summoned, all of whom fall into two broad categories. They are all persons who have retired from the services of the Western Railway several years earlier. The first category of these witnesses claim that they knew the particular accused insofar as they were working with them in the department. The second category of witnesses claims that at some point of time or the other, the concerned accused were subordinates to them. This makes little difference because these persons admitted that they have retired from service several years earlier and it was demonstrated by Mr. Nakhwa that one of these persons has retired in the year 1971 and that he is solemnly deposing in evidence in the year 1983. The time frame is more or less common in the case of the witnesses and it is quite amazing that all of them uniformly depose in evidence that they do recall that during the years that they were in service, they had occasion to see the handwriting and signatures of a concerned accused and that their eye-sight and memory is so precise and so sharp and so reliable that they are able to tell the court that the handwriting and signatures on documents shown to them in court belonged to a particular accused. Mercifully, the learned Special Judge himself, in the judgment, has realised the weakness of evidence of this type, but the learned Special Judge has got over it by following an equally unsatisfactory procedure. The learned Special Judge states that he has conveniently resolved the entire challenge of the defence under this head by taking out the *Vakalatnamas* that were filed by the accused before the court and has satisfied himself from the signatures appearing thereon that the documents were signed by the accused. It is quite true that in a given case for the purposes of satisfying itself the court may even look at the admitted signatures on a *Vakalatnama* or documents filed before the court for the purpose of resolving a minor controversy. In the present case, however, the lacuna was far more substantial insofar as the prosecution has not discharged the basic burden cast on it and that lacuna, to my mind, could not have been cured by the learned Special Judge coming to the assistance of the Prosecution by stating that the infirmities pointed out by the defence have been undone through the comparison of the signature on the *Vakalatnamas* before the court, which still leave out the handwritings.

10. Mr. Lambay, the learned Additional Public Prosecutor, has stoutly defended the procedure adopted by the Prosecution by pointing out that under section 73 of the Evidence Act, it is quite permissible for a witness to identify a handwriting and signatures with which he is familiar. Mr. Lambay has also pointed out that if at all there was any shadow of doubt, as an additional precaution and safety measure that the learned Special Judge has resolved the controversy by making a comparison with the *Vakalatnamas* that were filed in the court. Unfortunately, this submission is unacceptable insofar as it would be a dangerous precedent to permit identification and proof of this type, and in the present case, it suffers from an inherent weakness that makes the method of proof wholly unsatisfactory. To this extent, the lacuna pointed out by Mr. Nakhwa with regard to the entire set of documents proved by the prosecution by this method will have to be upheld and it will have to be, consequently, held that none of the documents in question can be said to have been proved.[1]

10.26.52 Court can Act as Handwriting Expert[162]

It has been constantly laid down by this court that where a case rests squarely on circumstantial evidence the inference of guilt can be justified only when all the incriminating facts and circumstances are found to be incompatible with the innocence of the accused or the guilt of any other person. (See: *Hukam Singh v State of Rajasthan*, AIR 1977 SC 1063 : (1977) 2 SCC 99; *Eradu v State of Hyderabad*, AIR 1956 SC 316 : 1956 Cr LJ 559 ; *Earabhadrappa v State of Karnataka*, AIR 1983 SC 446 : (1983) 1 SCC 330 : 1983 Cr LJ 846 ; *State of Uttar Pradesh v Sukhbasi*, AIR 1985 SC 1224 : 1985 Cr LJ 1479 : 1985 (2) Crimes 465 ; *Balwinder Singh v State of Punjab*, AIR 1987 SC 350 : (1987) 1 SCC 1 : 1987 Cr LJ 330 ; *Ashok Kumar Chatterjee v State of Madhya Pradesh*, AIR 1989 SC 1890 : 1989 (2) Crimes 423).

The circumstances from which an inference as to the guilt of the accused is drawn have to be proved beyond reasonable doubt and have to be shown to be closely connected with the principal fact sought to be inferred from those circumstances. In *Bhagat Ram v State of Punjab*[163] it was laid down that where the case depends upon the conclusions drawn from circumstances, the cumulative effect of the circumstances must be such as to negative the innocence of the accused and bring the offences home beyond any reasonable doubt.

In *Padala Veera Reddy v State of Andhra Pradesh*,[164] it was laid down that when a case rests upon circumstantial evidence, such evidence must satisfy the following tests:

1. the circumstances from which an inference of guilt is sought to be drawn, must be cogently and firmly established;
2. those circumstances should be of a definite tendency unerringly pointing towards guilt of the accused;
3. the circumstances, taken cumulatively, should form a chain so complete that there is no escape from the conclusion that within all human probability the crime was committed by the accused and none else; and
4. the circumstantial evidence in order to sustain conviction must be complete and incapable of explanation of any other hypothesis than that of the guilt of the accused and such evidence should not only be consistent with the guilt of the accused but should be inconsistent with his innocence.

In *State of Uttar Pradesh v Ashok Kumar Srivastava,*[165] it was pointed out that great care must be taken in evaluating circumstantial evidence and if the evidence relied on is reasonably capable of two inferences, the one in favour of the accused must be accepted. It was also pointed out that the circumstances relied upon must be found to have been fully established and the cumulative effect of all the facts so established must be consistent only with the hypothesis of guilt.

What is important is that the possibility of the conclusions being consistent with the innocence of the accused must be ruled out altogether.

Some dispute appears to have been raised before the High Court as also before us that the hotel records should not be relied upon to indicate that the appellant had stayed in "Ashoka Lodge".

Ajit (P.W. 2), room-boy of the "Lodge", in his statement on oath has given out that the appellant had come with his wife and child to the "Ashoka Lodge" and had taken one room on the ground-floor for his stay. The necessary entry [Ex. P-1(a)] was made by the Manager of the "Lodge" in the "Register of Lodgers". The appellant had put his signature on the Register

162. *Ajit Savant Majagavi v State of Karnataka*, AIR 1997 SC 3255 : 1997 AIR SCW 3315 : 1997 Cr LJ 3964.
163. AIR 1954 SC 621 : 1954 Cr LJ 1645.
164. AIR 1990 SC 79 : 1989 All AC (Cri) 236 : 1990 Cr LJ 605.
165. (1992) 2 SCC 86 : 1992 Cr LJ 1104 : 1992 AIR SCW 640.

which is Ex. P-1(b). The appellant, his wife and the child had been taken by the room boy to Room No. 113 where he also supplied an extra bed. The Hotel Manager though mentioned as a witness in the charge-sheet was not examined as he had already left the service of the "Lodge". These facts stand proved by the statement of the room-boy and the High Court has already recorded a finding that the appellant had stayed in Room No. 113 of the "Ashoka Lodge".

The original records were also placed before us and we have perused those records. Since learned counsel of the appellant contended that the appellant had not stayed in the "Ashoka Lodge", we looked into the "Register of Lodgers". It contains the relevant entry against which signature of the appellant also appears. His signature also appears on the *Vakalatnama* filed by him in this appeal. In the presence of the learned counsel for the parties, we compared the signature of the appellant on the *Vakalatnama* with the signature in the "Register of Lodgers". A mere look at the signatures was enough to indicate the similarity which was so apparent that it required no expert evidence. This comparison was done by us having regard to the provisions of section 73 of the Evidence Act which provides as under:

> **73. Comparison of signature, writing or seal with others admitted or proved.** In order to ascertain whether a signature, writing or seal is that of the person by whom it purports to have been written or made, any signature, writing or seal admitted or proved to the satisfaction of the Court to have been written or made by that person may be compared with the one which is to be proved, although that signature, writing or seal has not been produced or proved for any other purpose.

The Court may direct any person present in court to write any words or figures for the purpose of enabling the Court to compare the words or figures so written with any words or figures alleged to have been written by such person.

The section consists of two parts. While the first part provides for comparison of signature, finger impression, writing,, allegedly written or made by a person with signature or writing,, admitted or proved to the satisfaction of the court lo have been written by the same person, the second part empowers the court to direct any person including an accused, present in court, to give his specimen writing or fingerprints for the purpose of enabling the court to compare it with the writing or signature allegedly made by that person. The section does not specify by whom the comparison shall be made. However, looking to the other provisions of the Act, it is clear that such comparison may either be made by a handwriting expert under section 45 or by anyone familiar with the handwriting of the person concerned as provided by section 47 or by the court itself.

As a matter of extreme caution and judicial sobriety, the court should not normally take upon itself the responsibility of comparing the disputed signature with that of the admitted signature or handwriting and in the event of the slightest doubt, leave the matter to the wisdom of experts. But this does not mean that the court has not the power to compare the disputed signature with the admitted signature as this power is clearly available under section 73 of the Act: See *State (Delhi Administration) v Pali Ram.*[166]

We have already recorded above that on the comparison of the signature in the "Register of Lodgers" with the appellant's signature on the *Vakalatnama*, we have not found any dissimilarity and are convinced that the appellant himself had signed the "Register of Lodgers" in token of having taken Room No. 113 in "Ashoka Lodge" on rent wherein he had stayed with his wife and the child.

On an overall consideration of the matter, we are of the opinion that the High Court, in reversing the judgment of the trial court, had fully adhered to the principles laid down by this court in various decisions and there is no infirmity in its judgment.

166. AIR 1979 SC 14 : (1979) 2 SCC 158.

The circumstances, the conduct and behaviour of the appellant conclusively establish his guilt and no amount of innovative steps by him including sporting a beard and latter shaving off the beard and the head could conceal the offence or his identity. It was rightly remarked by the famous Urdu poet Amir Meenai in a couplet:

Qareeb hai yaro jo Roz-i-Mahshar

Chhupey ga kushton ka khoon keonkar

Jo chup Rahegi Zaban-i-Khanjar

Lahoo Pukarega Aastin ka

Translated into English, it will mean:

On the day of judgment, you will not be able to conceal the killing of innocents. If the sword will keep silent, the bloodstains on your sleeves will reveal your guilt.

For the reasons stated above, we find no merit in the appeal which is dismissed. The appellant is on bail. His bail bonds are cancelled. He shall be taken into custody forthwith to serve out the life sentence. Appeal dismissed.[167]

10.26.53 Comparison of Signatures without the Aid of Expert[168]

As a sample of oral evidence, our attention was invited to the evidence of P.W. 58. P.W. 58 in the Chief Examination has stated as follows:

I cast my vote in Mavilayi polling station. The polling station was in Cherumavilayi UP School. (Ext. P-711 marked) Ext. P-711 counterfoil confronted to the witness and the witness denies the signature (Ext. P-712 marked). Ext. P-712 counterfoil shown to the witness. The signature in that also is denied by the witness. Ex. P-891 declaration shown to the witness. Witness admits the signature. Voter No. 142 Utheranchalil KK Chandia w/o Chandran of polling station No. 69 is myself. I have still doubt whether Ext. P-712 is signed by me. I am certain that the signature found in Ext. P-711 is not my signature.

On the above evidence the conclusion of the learned Judge is as follows:

According to P.W. 53 she had cast only one vote No. 142. The corresponding counterfoil is marked as Ext. P-711. When this was confronted to the witness she denied the signature therein. Ext. P-712 is the counterfoil corresponding to voter No. 239. The signature is Ext. P-711 and Ext. P-712 are almost similar. There is a slight variation. But that does not affect the petitioner's case, as the signature in Ext. P-712 is exactly similar to the signature put by the witness in the deposition. Therefore, it is clear the voter No. 142 and 239 in Ext. P-60 is one and the same person and that voter has cast more than one vote. In the result, I declare that vote cast against counterfoil No. 070975 (Ext. P-711) of polling station No. 69 and the vote cast against counterfoil No. 070258 (Ext. P-712) polling station No. 69 are void.

In another instance the learned Judge held as follows:

The signature of the witness in the deposition does not tally with the signature found in these two counterfoils. On a comparison of the signature in Ext. P-713 and P-714 I have little doubt that the same witness has cast two votes. Therefore, I declare that vote cast against counterfoil No. 070653 (Ext. P-713) of polling station No. 69 and the vote cast against counterfoil No. 070309 (Ext. P-714) of polling station No. 69 are void.

While appreciating the evidence of P.W. 69 the court held as follows:

P.W. 69 admits that he is voter No. 1392 in Ext. P-53 electoral roll. The witness also admits that voter No. 563 in Ext. P-47 refers to him. According to this witness he had cast vote in polling station No. 53. The two counterfoils were shown to the witness and he denied both. In the cross-examination, however, he stated that he has no connection with Kadampeth house

167. *Ajit Savant Majagavi v State of Karnataka*, AIR 1997 SC 3255 : AIR 1997 SCW 3315 : 1997 Cr LJ 3964.
168. *O Bharathan v K Sudhakaran,* AIR 1996 SC 1140 : JT 1996 (2) SC 384 : 1996 AIR SCW 685.

and that voter No. 1392 in Ext. P-53 is not himself. The signatures in the two counterfoils are not closely similar. So, it cannot be said that both votes were cast by P.W. 69. The signature in Ext. P-762 has got similarity with the signature of the witness in the deposition. So, the vote against Ext. P-761 must have been cast by some other person. Therefore, I hold that the vote cast against counterfoil No. 062682 (Ext. P-761) in polling station No. 61 reads invalid vote.

The evidence of P.W. 146 reads as follows:

My father's name is Chathukutty. My house is Challivalappil. My mother's name is Lakshmi and I am a driver by profession. Ext. P-50. Sl. No. 192 Balakrishnan Chathukutty aged 30 is myself. Sl. No. 47 in Ext. P-103. Balakrishnan Chathukutty Nambiar is not myself. My father is not Chathukutty Nambiar. (Counterfoil Nos. 12084 and 056691 are marked as Ext. P-936 and 937). Witness denies both the signatures. I have cast only one vote.

Cross-examination by 1st respondent's counsel:

In Ext. P-50 against Sl. No. 642 the house No. shown is 245. It is not my house number. I have no connection with the house by name Krishnalayam. Sl. No. 642 is of Krishnan Nambiar. I am a member of Thiyya community. Witness says that he is in possession of driving licence and shown the same before court and his name has been written there as CV Balakrishna. The driving licence also contains a photograph of the witness.

On the above evidence, the High Court found as follows:

P.W. 146 Balakrishna admits that his father's name is Chathukutty and his mother's name is Lakshmi. He also admits that he is voter No. 1192 in Ext. P-50 electoral roll, but he denies that he is voter No. 47 in Ext. P-103 electoral roll. The voter No. 47 is one Balakrishnan Chathukutty Nambiar and according to this witness his father is not Chathukutty Nambiar and that he belongs to Thiyya community. But it is pertinent to note that in Ext. P-50 voter No. 1192 is shown as resident of house No. 245, in the original voters' list of polling station No. 50, house No. 245 is described as Krishnalyam and voter No. 642 is one T. Krishan Nambiar. P.W. 146 is not in a position to explain as to how his name happened to be included as a resident of the house of Krishnan Nambiar. So, even in the admitted entry there is voter No. 1192 in Ext. P-50. The corresponding counterfoil is marked as Ext. P-93. Even though the witness denies his signature therein, that is to be taken as his admitted signature as it corresponds with his admitted entry. The signature in Ext. P-937 is strikingly similar to the signature in Ext. P-36 counterfoil. So, it is clear that the person who put the signature in Ext. P-937 must have put the signature in Ext. P-936 also. Therefore, it is proved that there is not only similarity in the name but there is close similarity between the two signatures also. So I hold that P.W. 146 had cast two votes. In the result, I declare that the votes cast against counterfoil No. 120847 (Ext. P-936) in polling station No. 115 and the vote cast against counterfoil No. 056691 (Ext. P-937) in polling station No. 56 are void.

Likewise, while commenting on P.W. 149 the court held as follows:

According to witness she had cast, vote in polling station No. 91 as voter No. 683. The corresponding counterfoil, marked as Ext. P-942, was shown to the witness. She denied the signature therein. Ext. P-943, the counterfoil of voter No. 1143 in Ext. P-78 was shown to the witness. She denied that signature also. But on a bare perusal of these two signatures it can be seen that there is close resemblance between the two. The similarity in name and the close resemblance of the two signatures in the counterfoils would clearly establish that P.W. 149 had cast two votes. In the signature in Ext. P-942 and 943 the first letter 'K' is' so conspicuous and the style of writing and the figure of the signatures are exactly similar. Under the above circumstances, I hold that P.W. 149 had cast two votes. Therefore, the vote cast against counterfoils No. 093440 (Ext. P-942) in polling station No. 91 and the vote cast against counterfoil No. 091398 (Ext. P-943) in polling station No. 89 is declared void.

Similar are the cases rendering 65 witnesses at least. This is not seriously disputed by the learned counsel for the first respondent. Though the signatures are challenged, the learned Judge overruled the objection raised by the learned counsel for the appellant herein that unless the disputed signatures are compared with the admitted signatures, the same cannot be taken into account proceeded to compare the signatures by himself and found that they are either similar or slightly varying.

> *It appears that the learned Judge has decided the question of void and invalid votes on insufficient materials and evidence in the case. Majority of the witnesses denied that they have voted more than once and they have also denied their signatures in the counterfoils. Under such circumstances, the learned Judge could have summoned documents containing admitted signatures for comparison by an expert and also by comparing them himself. Instead the learned Judge understood the hazardous task of comparing hundreds of disputed signatures which are not having individual characteristics to set aside the election of a candidate, the appellant herein.*

The learned Judge in the course of the judgment has observed as follows:

> *Most of the witnesses either denied their signatures or expressed their inability to identify their signatures, in the case of some well-educated persons when counterfoils containing the signature were shown to them they stated that they could not identify the signatures. Every reasonable prudent person would be able to identify his signature whenever the signature is shown to him.*

Notwithstanding the above fact, namely, the learned Judge while doubting the testimony of the witnesses, instead of confronting them in a legal way to get the truth, jumped to his own conclusion. The learned Judge in the course of appreciating the scope of section 73 of the Evidence Act and having given a finding that under section 73 of the Evidence Act a disputed signature could be compared only with the admitted signatures, proceeded to compare the signatures found in the counterfoils to find out whether both the signatures were to be by the same person.

On the peculiar facts of this case, the learned Judge erred in taking upon himself the task of comparing the disputed signatures on the counterfoils without the aid of an expert or the evidence of persons conversant with the disputed signatures. Therefore, the approach made by the learned Judge is not in conformity with the spirit of section 73 of the Evidence Act. Though the rulings of this court in *State (Delhi Admn) v Pali Ram,*[169] and *Fakhruddin v State of Madhya Pradesh,* [170]were brought to his notice, the learned Judge proceeded to compare the disputed signatures by himself and decided the issue. While doing so, the learned Judge observed as follows:

> *So all these witnesses are in the habit of occasionally putting their signature. Strangely enough most of the witnesses either denied their signature or expressed their inability to identify their signature. Even in the case of some well-educated person counterfoils containing the signatures were shown to them. They stated that they could not identify the signatures. Every reasonable prudent person would be able to identify his signature whenever the signature is shown to him. It is clear that these witnesses denied their signatures or failed to identify the signature with a definite purpose that at least one signature should not be taken as the admitted signature so as to make a comparison with the denied signature, it is also possible that the witnesses who had cast more than one vote pretended that they could not identify any of the signatures to make believe that they had not cast more than one vote. The denial of the signatures and failure of these witnesses to identify their own signatures are to be viewed in the background of similarity of the signatures found in the various counterfoils.*

Again the learned Judge observed as follows:

> *It is true that under section 73 of the Evidence Act a disputed signature could be compared only with the admitted signature or signature proved to the satisfaction of the court to have been written or made by that person. Reliance was placed on the decision reported in State (Delhi Admn) v Pali Ram, AIR 1979 SC 14, and contended that it is not advisable that a Judge should take up the task of comparing the admitted handwriting with the disputed one to find out whether the two agree with each other and the prudent course is to obtain the opinion and assistance of an expert. This opinion was expressed by the Supreme Court in a criminal case while considering the question whether the accused had committed the offence of forgery and cheating. In* Fakhruddin *v* State of Madhya Pradesh, *AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197, the Supreme Court observed that comparison of the handwriting by the court with the other documents not challenged as fabricated, upon its own initiative and*

169. AIR 1979 SC 14 : (1979) 2 SCC 158 : 1979 Cr LJ 17.
170. AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.

> *without the guidance of an expert is hazardous and inconclusive. These observations were made in the facts and circumstances of such case. But, in the instant case, a comparison of the signature found in the counterfoil are made to ascertain whether both signatures were put by the same person.*

In the instant case, several witnesses who are alleged to have exercised their franchise more than once admitted that their names have been included in the electoral roll. They would say that they cast only one vote. In cases where their names are entered more than once in the electoral roll these witnesses admitted one entry and denied the other. The counterfoil corresponding to the admitted entry in the electoral roll must contain the signature of the voter. Even though this signature has also been denied by the witness or rather failed to be identified by the witness, it can safely be taken as the admitted signature of the witness. That signature could be very well compared with the signature appearing in the disputed counterfoil.

So, the standard of strict proof can be insisted only in the election petition wherein the election is sought to be set aside on the ground of corrupt practice. In the instant case it can only be said that standard of proof should be of high nature, as an election petition is not liable to be set aside on vague or inaccurate evidence, and the court must uphold an election when two different views are reasonably possible, from the evidence adduced in the case:

> *As already pointed out by me the close similarity in the signature in the counterfoils is also a strong proof to show that the entry related to the same person. It is also important to note that most of the witnesses denied their signatures on both the counterfoils. They could not identify their own signature and it is also clear that many of these witnesses changed their signatures and put different signatures in the deposition. In some cases, the witnesses were asked to give specimen signatures and these specimen signatures were taken in open court and they are marked as exhibits in the case. The specimen signatures in many cases do not tally with the signatures found in the counterfoil of the voter, who admittedly cast his vote as voter against a particular serial number. With this broad outline in the evidence I propose to consider the evidence of each witness who allegedly cast vote more than once.*

It is on the basis of such conclusion the learned Judge arrived at the finding that 269 votes were void as one voter has voted twice. As pointed out earlier at least in the cases of 65 such witnesses (that means 30 votes) where the signatures are not admitted the findings of the learned Judge cannot be supported for the reasons given earlier. If those 130 votes which were declared void, and found polled in favour of the appellant herein are taken into account in his favour, certainly the appellant must be found to have secured more votes than the first respondent herein.

The learned Judge in our view was not right either in brushing aside the principles laid down by this court in *State (Delhi Admn) v Pali Ram,*[171] on the ground that it was not a criminal case or taking upon himself the hazardous task of adjudicating upon the genuineness and authenticity of the signatures in question even without the assistance of a skilled and trained person whose services could have been easily availed of. Annulling the verdict of popular will is as much a serious matter of grave concern to the society as enforcement of laws pertaining to criminal offences, if not more. Though it is the province of the expert to act as Judge or jury after a scientific comparison of the disputed signatures with admitted signatures, the caution administered by the court is to the course to be adopted in such situations could not have been ignored unmindful of the serious repercussions arising out of the decision to the ultimately rendered. To quote, it has been held in *State v Pali Ram:*[172]

> *The matter can be viewed from another angle also. Although there is no legal bar to the Judge using his own eyes to compare the disputed writing with the admitted writing, even without the aid of the evidence of any handwriting expert, the Judge should, as a matter of prudence and*

171. AIR 1979 SC 14 : (1979) 2 SCC 158 : 1979 Cr LJ 17.
172. AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.

caution, hesitate to base his finding with regard to the identity of a handwriting which forms the sheet-anchor of the prosecution case against a person accused of an offence, solely on comparison made by himself. It is, therefore, not advisable that a Judge should take upon himself the task of comparing the admitted writing with the disputed one to find out whether the two agree with each other; and the prudent course is to obtain the opinion and assistance of an expert.

The necessity for adhering to the said sound advice and guidance is all the more necessary in a case where hundreds of signatures are disputed and the striking dissimilarities noticed by the court at the time of the trial of the Election Petition.

The learned counsel appearing for the first respondent was not able to convince us that the learned Judge was right in comparing the signatures himself at any rate in the peculiar facts and circumstances of the case and rendering the findings against the appellant herein. As we are satisfied on the peculiar facts of this case also that the learned Judge was not right in deciding hundreds of the disputed signatures by comparing the counterfoils by himself to declare the votes as void. We need not go into other arguments advanced before us.

As we find that at least 130 votes are validly polled in favour of the appellant for the reasons given earlier then he must be held to have secured 43 votes more than then first respondent herein.

In the result, we hold that the learned Judge was not right in declaring the election of the appellant as void and declaring the first respondent as duly elected. Accordingly, the appeal is allowed, and the Election Petition is dismissed with costs throughout.[173]

10.26.54 Court should use Expert Help[174]

After the arguments were concluded on 6 October 1989 and judgment was reserved, on my careful comparison of the signatures of P.W. 2 found in Exs. D-3 to D-5 (disputed) and his admitted signatures in Exs. P-2, P-4 and in his deposition in court, I was of the opinion that it was better that a Handwriting Expert offered his opinion regarding the admitted and disputed signatures of P.W. 2 to facilitate arriving at a safe conclusion with regard to the identity of the signatures in Exs. D. 3 to D. 5, which formed the sheet-anchor of the defence case. On 24 October 1989 I heard the defence counsel as well as the counsel for the respondent and basing my view on the principle of law laid down by the Apex Court in *State (Delhi Administration) v Pali Ram*[175] I directed that the disputed writings of P.W. 2 in Exs. D-3 to D-5 and the admitted writings of P.W. 2 in his court deposition, Exs. P-2 and P-4 be forwarded to the Handwriting Expert attached to the State Forensic Laboratory for comparison and opinion. Accordingly, the aforementioned documents were sent to the Handwriting Expert, who by his report dated 4 December 1989, offered his opinion. On 7 December 1989 on the plea made by the learned counsel for the defence as well as the prosecution, I directed issue of summons to AS Ramu; Scientific Assistant Grade-1, Forensic Science Department, Madras-4, to appear before the court with all necessary material to give evidence in respect of his opinion offered in D.O.C. No. 359 of 1989 dated 4 December 1989 and T.No. 7220/89 D.O.C. 359/89, dated 4 December 1989 on 13 December 1989. I also directed the office to take Xerox copies of the opinion of the Expert and furnish those copies to the prosecution as well as the accused on or before 11 December 1989.

On 13 December 1989 the Expert was examined in court and both the parties were afforded an opportunity to question the Expert. The disputed signatures in Exs. D-3 to D-5 were marked by him as Q-l, Q-2 and Q-3 respectively. The admitted signature of P.W. 2 in Ex. P-2 was numbered by him as S-1. The admitted signature of P.W. 2 on the reverse of Ex. P-4 was

173. *O Bharathan v K Sudhakaran,* AIR 1996 SC 1140 : JT 1996 (2) SC 384 : 1996 AIR SCW 685.
174. *Palania Pillai v State,* 1991 Cr LJ 1563.
175. *State v Pali Ram*, AIR 1979 SC 14 : (1979) 2 SCC 158 : 1979 Cr LJ 17.

marked as S-2. The admitted signatures of P.W. 2 in his deposition before Additional Special Judge, in seven sheets, were marked as S-3 to S-15. The deposition itself was marked as Ex. C-l before this court. Out of the seven sheets, the first six sheets contain the signature of P.W. 2 on either side, while in the last sheet, it is found only on one page, where the deposition has ended, the other side of the paper being blank. The Expert deposed that he had examined the above signatures found in Q-l to Q-3 and S-1 to S-15 carefully and that the person who wrote the red enclosed signatures stamped and marked as section 1 to section 15, did not write the red enclosed signatures similarly stamped and marked as Q-l to Q-3. The reasoning sheet enclosed by him was marked as Ex. C-2. The enlargements of the signatures of P.W. 2 (admitted as well as disputed) were marked as Ex. C-3. The opinion expressed by him in court, forms part of his report as well, which is included in Ex. C-2. The Expert has deposed that he has been giving evidence in courts for the last 5 years and he has offered his opinion in more than 100 cases. The learned counsel for the appellants, strenuously cross-examined him on various aspects, and in the ultimate analysis, his opinion was that the variations pointed by the defence were only natural variations and were not distinctly different. He deposed that in Ex. C-2, one was the opinion and the other was the reasoning. When he was questioned about the signature of the Scientific Officer in the report, he stated that he (AS Ramu) analysed the admitted and disputed signatures and the Scientific Expert appended his signature after seeing the analysis done by him, because it was the procedure in the Department, that a Gazetted Officer had to put his signature. He was questioned about the quality of paper, pen pressure, different kinds of movements, pen-lifts He conceded that in the report he had only given the differences in the admitted and the disputed signatures and had not given the similarities which, however, had been taken into consideration, when the report was given. Usually, similarities were not noted down. He categorically replied that a person cannot forge his signature, though he could disguise it. He clarified it, by stating that if one wanted to disguise, he can do it in a different way. Forgery meant, according to him, trying to put the genuine signature of the man concerned, deceptively. It is not a case of P.W. 2 attempting to forge his own signature, since the man did not write in the usual manner he does. To a court question, he definitely stated that from a study of S-1 to S-15 and Q-l to Q-3, the persons who had put the signatures S-1 to S-15 had not put in differently in Q-l to Q-3.

After the recording of the evidence of the court witness, I again heard the submissions of the prosecuting and the defence counsel. They referred to me, passages from "*Handwriting and Thumb-print Identification and Forensic Science* by HR Hardless, 1970 Edition as well as from *Metha's Treatise on Handwriting Identification and Finger Prints"*. They also referred to certain decisions of the Supreme Court on the acceptability of otherwise of the opinion of the Handwriting Expert, while drawing my attention to the relevant recorded evidence.

As far as the evidence of the Handwriting Expert is concerned, the law is settled that such opinion evidence, cannot be stated to be conclusive. The court is competent to compare the disputed and admitted writings, even without examining an Expert to satisfy itself from its own observations, to arrive at conclusions; but, as a matter of prudence and caution, it was always better to have the opinion of an Expert, to facilitate the scrutiny of those signatures, through the eyes of the court. It will be relevant at this stage to quote the observations of the Supreme Court in *Fakhruddin v State of Madhya Pradesh:*[176]

> *Evidence of the identity of handwriting receives treatment in three sections of the Indian Evidence Act. They are sections 45, 47 and 73. Handwriting may be proved on the admission of the writer, by the evidence of some witnesses in whose presence he wrote. This is direct evidence and if it is available the evidence of any other kind is rendered unnecessary. The Evidence Act also makes relevant the opinion of a handwriting expert (section 45) or of one who is familiar*

176. AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197.

with the writing of a person who is said to have written a particular writing. Thus, besides direct evidence which is of course the best method of proof, the law makes relevant two other modes. A writing may be proved to be in the handwriting of a particular individual by the evidence of a person familiar with the handwriting of that individual or by the testimony of an expert competent to the comparison of handwritings on a scientific basis. A third method (section 73) is comparison by the court with a writing made in the presence of the court or admitted or proved to be the writing of the person.

Both under section 45 and section 47, the evidence is an opinion, in the former by a scientific comparison and in the latter on the basis of familiarity resulting from frequent observations and experience. In either case the court must satisfy itself by such means as are open that the opinion was be acted upon. One such means open to the court is to apply its own observation to the admitted or proved writings and to compare them with the disputed one, not to become an handwriting expert but to verify the premises of the expert, in the one case and to appraise the value of the opinion in the other case. This comparison depends on an analysis of the characteristics in the admitted or proved writings and the finding of the same characteristics in large measure in the disputed writing. In this way the opinion of the deponent whether expert or other is subjected to scrutiny and although relevant to start with becomes probative. Where an expert's opinion is given, the court must see for itself and with the assistance of the expert come to its own conclusion whether it can safely be held that the two writings are by the same person. This is not to say that the court must play the role of an expert but to say that the court may accept the fact proved only when it has satisfied itself on its own observation that it is safe to accept the opinion whether of the expert or other witnesses.

While on the topic of appreciation of the evidence of Expert, it will be relevant to refer to the observations of the Supreme Court in two of its pronouncements. In *Bhagwan Das v State of Rajasthan,*[177] the Supreme Court took the view that where the opinions of the author were neither shown to have been given in regard to circumstances exactly similar to those in the particular case before court; nor were they put to the medical witness, it was not a satisfactory was of disposing of the evidence of the witness to discredit it on the ground that the doctor was a comparatively young man and his statements did not accord with the opinions expressed in the books.

Similarly, in *Sunderlal v State of Madhya Pradesh,*[178] the Supreme Court observed as follows:—

The conviction of the accused by the High Court was mainly based on passages from the text book of Modi on Medical Jurisprudence and Toxicology *and these passages had not been put to Dr. Dube when he was in the witness box with the result that the High Court was not right in coming to the conclusion adverse to the accused by merely relying upon these passages. It is therefore evident that before reliance can be placed on authoritative textbooks by either party to attack the evidence of an expert, it would be necessary to draw the attention of the expert to those passages and furnish him an opportunity to explain the same.*

Before closing the consideration of the defence case, the evidence of the Handwriting Expert, examined by me, will have to be considered. The evidence of the Expert is categoric that the person who had written S-1 to S-15 had not written Q-l to Q-3. I have carefully perused the evidence of the Expert and I am satisfied that the reasons given by him are acceptable. I am not taking the evidence of the Expert as conclusive, to arrive at a conclusion, but I have taken his opinion to lend assurance to my own study of the admitted and disputed signatures. A close look at the admitted and disputed signatures with a magnifying glass certainly shows that the author of Q-1 to Q-3 could not be P.W. 2. The way in which the first four letters "Muru" have been written in D-3 to D-5 portrays a mechanical imitation. Even the first letter 'S' is patently at variance, so also the penultimate letter "A" and the letter "g". It is, of course, true that the Expert has been cross-examined on, the several movements, pen-lifts, pen pressure,

177. *Bhagwan Das v State of Rajasthan*, AIR 1957 SC 589 : 1957 Cr LJ 889 : 1957 SCJ 515.
178. AIR 1954 SC 28 : 1954 Cr LJ 257.

pen score, hesitation symptoms, The answers given by the Expert, on the differences pointed out to him, as natural variations, to my mind, is certainly acceptable. I am unable to agree that P.W. 2 himself had sought to forge his signature, by writing differently, in Exs. D-3 to D-5. When I consider the case law placed before me, I will refer to the authoritative text books, on handwriting and fingerprints with specific reference to the passages brought to my notice by the learned counsel for the appellants. Suffice to say that I am satisfied that P.W. 2 had not signed Exs. D-3 to D-5 and the case of the defence that P.W. 2 had signed those documents on 29 September 1984, has to be rejected, outright.

While considering Exs. D-3 to D-5, the trial Judge had taken note of the documents filed along with the statement of A-l. Those documents show that A-l had functioned as President of the Southern Division between 1978 and 1984. It may, therefore, be taken that A-l was taking an active interest in the Union activities. However, as rightly pointed out by the trial Judge, there is no material placed before the court to hold that A-l had a leading role in organising the All India Conference at Madras between 12 and 16 October 1984. As stated earlier, we do not have any evidence from the signatories, who were office-bearers, found in those documents as having authorised the appellants to collect the donation. It may be that the defence need not have to prove its case by strict standards of proof, as is expected of the prosecution, but, at the same time, when a partial onus is thrust on them, the defence must basically inspire confidence, as probable. That inspiration is not forthcoming in defence trotted out in this case.

In paras 16 and 19 I have already considered four of the cases relating to the appreciation of evidence of handwriting experts. Two other cases have been cited on this aspect, which I will presently refer to.

In *Iswari Prasad Misra v Mohd Isa*[179] the Supreme Court while considering section 45 of the Indian Evidence Act, regarding the relevancy of opinions of experts held, that the evidence given by experts of handwriting can never be conclusive, because it was after all opinion evidence. In that case the Supreme Court, sans the evidence of the two experts, who contradicted themselves, arrived at the conclusion that the evidence given by the attesting witnesses, the scribe and the appellant, was wholly satisfactory to prove execution of the document by the respondent and that the said evidence did not really need to be corroborated by the opinion of experts. On facts, in this appeal, P.W. 2, having denied his signatures in Exs. D-3 to D-5 and the evidence of D.W. 3 having been rejected, and my comparison of the admitted and the disputed writings of P.W. 2, having been found to enure in favour of the prosecution, the evidence of expert has played only a minor role, in helping me to arrive at my conclusions. Further, the expert evidence has not been considered, for proof of the prosecution case, but only to the limited extent of the defence case being probable by preponderance.

In *Ram Narain v State of Uttar Pradesh,*[180] the Supreme Court held that the opinion of the Handwriting Expert given in evidence was no less fallible than any other expert opinion, but such opinion was worthy of acceptance if there was internal and external evidence relating to the writing in question supporting the experts view. The question in each case calls for determination on the court's appreciation of evidence. Ultimately, the facts unfurled in each case, would dictate to the court, the weight that could be attached to the evidence of expert in the light of its own observation relating to the admitted and the disputed writings. As I have already held, on reasons assigned by me that P.W. 2 had not written Exs. D-3 to D-5, no further discussion on the expert's evidence would be necessary. However, reference to textbooks cited by Sri NT Vanamamalai need mention. HR Hardless in his book *Handwriting and Thumb-print Identification and Forensic Science*, 1970 Edn, has stated

179. AIR 1963 SC 1728 : (1963) 2 SCR 723 : 1963 BLJR 226.
180. AIR 1973 SC 2200 : (1973) 2 SCC 86 : 1973 Cr LJ 1187.

at p 2 that a competent expert assigns reasons for his opinion in a report. The reasons are specific and not mere generalities and the points of similarity or dissimilarity marked and indicated in the photographs are both apparent and appealing to laymen. An expert's opinion is accepted by a court when the reasons given are both apparent and convincing. At p 10 the author has stated as follows:

> *These persons are unaware of the fact that variations in the signatures of the same person must exist in the forms of corresponding letters. A human hand is not a printing machine to give exactitude in regard to forms of letters on all occasions and under different occasions.*

On these passages it was argued that the expert has not specifically dealt with the similarities and the opinion being general would be of no probative value. Further, in view of the human hand not being a printing machine, allowances should have been given by the expert on the features like pen pressure, pen score, pen lift hesitation, quality of paper, As I have discussed earlier, the expert has been cross-examined and I am satisfied, that he has offered his opinion, in the background of these features and the variations pointed out by the defence between the admitted and the disputed signatures, were only natural.

Mehta in his book on *Handwriting Identification and Fingerprints* has stated at p 38 that the pen pressure of a forged writing is usually not smooth and it shows a varying density due to the constant interruptions in movement and speed. At pp 47, 48, 49, 51 and 52 the author refers to the writing habits *viz.:*

1. The movement of writing;
2. The pen position;
3. The pen pressure;
4. The shading;
5. The relative position of the letters;
6. The formation of the letters;
7. The alignment;
8. The spacing;
9. The variations;
10. The slant;
11. The arrangement;
12. The style;
13. The condition of the strokes;
14. The size and proportions; and
15. The general execution.

The author states that there are other technical reasons which are advanced by the experts. Though the expert has been questioned in general on these aspects, specific passages from the authors had not been brought to his notice to furnish him an opportunity to explain his opinion on that basis. The expert has stated in his evidence that the characteristics in the handwriting in Exs. D-3 to D-5 differed significantly from the standard handwriting, which included among other things the five categories suggested by the defence. The expert has also answered that he had noticed all the characteristics, though he had not specified them in the report. I am satisfied that the dissimilarities noticed by him in the admitted and the

disputed writings would be sufficient to hold against the defence. To arrive at my conclusion of dissimilarities, the expert's opinion was to some extent helpful and the findings against the accused are not based solely on the evidence of the expert. Therefore, the discussion on expert's evidence need not have to detain us anymore.[181]

10.26.55 Typewriting Identification Evidence Admissible[182]

The reference made in this appeal to the Constitution Bench is for deciding the important question of law: Whether the opinion of a typewriter expert is admissible in evidence under section 45 of the Indian Evidence Act, 1872?

The respondent S.J. Chaudhary was being tried in the Court of Additional Sessions Judge, New Delhi, on charges punishable under section 302 of the Indian Penal Code and sections 3 and 4 of the Explosive Substances Act, 1908 in Sessions Case No. 36 of 1983. The prosecution wanted to examine a typewriter expert for proof of certain incriminating facts against the respondent based on the identity of a typewriter on which a material document was alleged to have been typed. An objection was taken to the admissibility of the opinion evidence of the typewriter expert under section 45 of the Indian Evidence Act, 1872 (for short "Evidence Act") based on the decision of this court in *Hanumant v State of Madhya Pradesh,* and the trial court upheld that objection, Criminal Revision No. 105 of 1987 was filed in the Delhi High Court by the prosecution challenging that order. The Delhi High Court has dismissed the revision, hence this appeal by special leave.

The present criminal appeal came up for hearing before a Division Bench comprising of two learned Judges of this court. The correctness of the observations in *Hanumant's* case (AIR 1952 SC 343) by a Bench of three learned judges on this point was doubted and reconsideration thereof was sought on behalf of the appellant. Accordingly, by order dated 22 March 1990 the Division Bench took the view that this important question of law involved in this appeal should be considered and decided by a larger Bench. This question of law is the only point involved for decision in this appeal and the decision thereon would dispose of the appeal.

In *Hanumant Govind,*[183] while dealing with one of the arguments advanced therein, it was stated thus:

> *Next it was argued that the letter was not typed on the office typewriter that was in those days,* viz.*, article B, and that it had been typed on the typewriter article A which did not reach Nagpur till the end of 1946. On this point evidence of certain experts was led. The High Court rightly held that opinion of such experts was not admissible under the Indian Evidence Act as they did not fall within the ambit of section 45 of the Act. This view of the High Court was not contested before us. It is curious that the learned judge in the High Court, though he held that the evidence of the experts was inadmissible, proceeded nevertheless to discuss it and placed some reliance on it. The trial magistrate and the learned Sessions Judge used this evidence to arrive at the finding that, as the letter was typed on article A which had not reached Nagpur till the end of December, 1946, obviously the letter was ante-dated. Their conclusion based on inadmissible evidence has therefore to be ignored.*

The above passage in that decision is the basis of the view taken that the opinion of a typewriter expert is not admissible under the Evidence Act and that it does not fall within the ambit of section 45 of the Act. It is significant that this view taken by the High Court in that case was not even contested in this court and, therefore, the decision in *Hanumant* proceeds on the concession that the evidence of a typewriter expert is not admissible in evidence under

181. *Palania Pillai v State,* 1991 Cr LJ 1563.
182. *State (through CBI/New Delhi) v SJ Choudhary*, AIR 1996 SC 1491 : 1996 Cr LJ 1713 : 1996 AIR SCW 1128.
183. AIR 1952 SC 343 : (1952) SCR 1091 : 1952 SCJ 509.

section 45 of the Act. In our opinion, the decision in *Hanumant* cannot be taken as deciding that point even though on the basis of that observation the evidence of typewriter expert was excluded as inadmissible. This question of law has, therefore, to be answered without any further assistance being available from the decision in *Hanumant*.

In the Indian Evidence Act, 1872, Chapter II relating to "Relevancy of Facts" contains sections 5 to 55 and therein under the heading "Opinions of Third Persons, when relevant" are sections 45 to 51. Section 45 reads thus:

> [s **45] Opinions of experts**. When the court has to form an opinion upon a point of foreign law or of science, or art, or as to identity of handwriting [184][or finger impressions], the opinions upon that point of persons specially skilled in such foreign law, science or art, [185][or in questions as to identity of handwriting] [186][or finger impressions] are relevant facts.

Such persons are called experts.

Illustration (c) to section 45 is as under:

> (c) The question is, whether a certain document was written by A. Another document is produced which is proved or admitted to have been written by A.
>
> The opinions of experts on the question of whether the two documents were written by the same person or by different persons are relevant.

The plain meaning of section 45 is that the court in order to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting, or finger impressions can treat the opinion upon that point of person specially skilled in such foreign law, science or art, or in questions as to identity of handwriting, or finger impressions as relevant facts. In other words, the opinion of persons specially skilled in such foreign law science, or art, or questions as to the identity of handwriting or finger impression, called experts therein, are relevant facts. The opinion of such experts is admissible in evidence as relevant facts by virtue of section 45 of the Evidence Act.

In our opinion, irrespective of the view taken on the question of meaning of the word handwriting in section 45 to include typewriting, the word "science", occurring independently and in addition to the word "handwriting" in section 45, is sufficient to indicate that the opinion of a person specially skilled in the use of typewriters and having the scientific knowledge of typewriters would be an expert in this science; and his opinion about the identity of typewriting for the purpose of identifying the particular typewriter on which the writing is typed is a relevant fact under section 45 of the Evidence Act. It is obvious that the Indian Evidence Act when enacted originally in 1872 did not specifically mention typewriting in addition to handwriting because typewriters were then practically unknown. However, the expression "science", or in section 45 in addition to the expressions "foreign law" and "handwriting" use in the section as originally enacted, and the expression 'finger impressions' inserted in 1899 is sufficient to indicate that the expression "science, or art" therein is of wide import. This expression 'science, or art' cannot therefore, have a narrow meaning in section 45 and each of the words "science" and 'art' has to be construed widely to include within its ambit the opinion of an expert

184. Ins. by Act 5 of 1899, section 3. For discussion in Council as to whether "finger impressions" include "thumb impressions", *see* Gazette of India, 1898, Pt VI, p 24.
185. Ins. by Act 18 of 1872, section 4.
186. Ins. by Act 5 of 1899, section 3. For discussion in Council as to whether "finger impressions" include "thumb impressions", *see* Gazette of India, 1898, Pt VI, p 24.

in each branch of these subjects, wherever the court has to form an opinion upon a point relating to any aspect of science or art.

The meaning of the word "science" as understood ordinarily with reference to its dictionary meaning must be attributed to the word as used in section 45 of the Indian Evidence Act. Some of the meanings given in the dictionaries are:

The Oxford Encyclopaedic English Dictionary:

> *Science... (a) systematic and formulated knowledge, esp. of a specified type or on a specified subject (political science), (b) the pursuit or principles of this....*
>
> *The New Shorter Oxford English Dictionary, vol 2:*
>
> *Science..... (2a) Knowledge acquired by study acquaintance with or mastery of a department of learning... (3a) A particular branch of knowledge or study; a recognized department of learning....*
>
> Collins Dictionary of the English Language:
>
> *Science (1) the systematic study of the nature and behaviour of the material and physical universe, based on observation, experiment, and measurement, and the formulation of laws to describe these facts in general terms. (2) the knowledge so obtained or the practice of obtaining it. (3) any particular branch of this knowledge: the pure and applied sciences. (4) any body of knowledge organised in a systematic manner. (5) skill or technique...*

It is clear from the meaning of the word "science" that the skill or technique of the study of the peculiar features of a typewriter and the comparison of the disputed typewriting with the admitted typewriting on a particular typewriter to determine whether the disputed typewriting was done on the same typewriter is based on a scientific study of the two typewritings with reference to the peculiarities therein; and the opinion formed by an expert is based on recognised principles regulating the scientific study. The opinion so formed by a person having the requisite special skill in the subject is, therefore, the opinion of an expert in that branch of the science. Such an opinion is the opinion of an expert in a branch of science which is admissible in evidence under section 45 of the Indian Evidence Act.

There cannot be any doubt that the opinion of an expert in typewritings about the questioned typed document being typed on a particular typewriter is based on a scientific study of the typewriting with reference to the significant peculiar features of a particular typewriter and the ultimate opinion of the expert is based on scientific grounds. The opinion of a typewriter expert is an opinion of a person especially skilled in that branch of the science with reference to which the court has to form an opinion on the point involved for decision in the case. In our opinion, on a plain construction of section 45 giving to the word 'science' used therein its natural meaning, this conclusion is inevitable; and for supporting that conclusion, it is not necessary to rely on the further reason that the word 'handwriting in section 45 would also include typewriting.

Statutory Interpretation by Francis Bennion, 2nd Edn, section 288 with the heading "Presumption that updating construction to be given" states one of the rules thus:

> *(2) It is presumed that Parliament intends the court to apply to an ongoing Act a construction that continuously updates its wording to allow for changes since the Act was initially framed (an updating construction). While it remains law, it is to be treated as always speaking. This means that in its application on any date, the language of the Act, though necessarily embedded in its own time, is nevertheless to be construed in accordance with the need to treat it as current law.*

In the comments that follow it is pointed out that an ongoing Act is taken to be always speaking. It is also, further, stated thus:

> *In construing an ongoing Act, the interpreter is to presume that Parliament intended the Act to be applied at any future time in such a way as to give effect to the true original intention. Accordingly the interpreter is to make allowances for any relevant changes that*

have occurred, since the Act's passing, in law, social conditions, technology, the meaning of words, and other matters. Just as the US Constitution is regarded as a living Constitution, so an ongoing British Act is regarded as "a living Act". That today's construction involves the supposition that Parliament was catering long ago for a state of affairs that did not then exist is no argument against that construction. Parliament, in the wording of an enactment, is expected to anticipate temporal developments. The drafter will try to foresee the future and allow for it in the wording.

An enactment of former days is thus to be read today, in the light of dynamic processing received over the years, with such modification of the current meaning of its language as will now give effect to the original legislative intention. The reality and effect of dynamic processing provides the gradual adjustment. It is constituted by judicial interpretation, year in and year out. It also comprises processing by executive officials.

There cannot be any doubt that the Indian Evidence Act, 1872 is, by its very nature, an "ongoing Act."

It appears that it was only in 1874 that the first practical typewriter made its appearance and was marketed in that year by the E Remington and Sons Company which later became the Remington typewriter. Obviously, in the Indian Evidence Act enacted in 1872 typewriting could not be specifically mentioned as a means of writing in section 45 of the Evidence Act. Ever since then, technology has made great strides and so also the technology of manufacturer of typewriters resulting in common use of typewriters as a prevalent mode of writing. This has given rise to development of the branch of science relating to examination of questioned typewriting.

In "*Questioned Documents*", 2nd Edn, by Albert S Osborn in the Chapter of "questioned typewriting" this aspect is considered and, therein at p 598, it is stated thus:

The principles underlying the identification of typewriting are the same as those by which the identity of a person is determined or a handwriting is identified. The identification in either case is based upon a definite combination of common or class qualities and features in connection with a second group of characteristics made up of divergences from class qualities which then became individual peculiarities.

The mathematical principles outlined in the fourteenth Chapter show how remote is the possibility of coincidence of even a few scars or deformities on a person, and the coincidence of scars and deformities are as remote with typewriters as with persons.

In "*Photographic Evidence*" by Charles C Scott, 2nd Edn, vol 1, under the heading "Typewriting Identity or Non-identity of Typing" it is stated thus:

But even as the nationality of an individual may be perplexing but does not in any way hamper the determination of his personal identity by means of his fingerprints, his handwriting, or other reliable indications, so also the fact that it is often difficult to determine the make of a typewriter used in typing a document does not lessen the reliability of the scientific determination that a certain typewritten document was typed on a particular machine regardless of its make. By the use of the proper microscopes and test plates the document examiner often can determine the question and by the use of photographic comparison charts he can demonstrate his findings, usually with unimpeachable certainty.

From a comparison of the typewriting on a document which is a subject of controversy with specimens known to have been made on a certain typewriter it is usually possible to determine whether or not what typewriter was used in typing the subject document, provided the subject document contains sufficient typewriting and the specimens from the known machine are of a suitable kind. This is true because every typewriter when it comes off the assembly line is an individual and writes exactly like no other typewriter. When a typewriter is brand new the differences between it and other typewriters coming off the assembly line at the same time are extremely minute and elusive, but theoretically at least there are identifying differences that can be discovered by microscopic examination and demonstrated photographically. Furthermore, the more a typewriter is used the more individualistic it becomes; and the easier it is to identify its

typewriting. In some instances, through overuse, misuse, or abuse a typewriter develops so many peculiarities that its typing can be identified readily with the naked eye.

In "*Law of Disputed and Forged Documents"* by J Newton Baker, while dealing with the basic principles of identification of typewriting generally it is stated:

… Since typewriting possesses individuality it can be compared and identified in the same manner as handwriting …

Therein while discussing individuality of typewriting, it is stated thus:

The individuality of the typewriter is established by the character of its type of impression on the paper. These characteristics of typewriting can be analysed, compared and differentiated and can be positively identified as those of a particular typewriter. This individual comparison and identification of characteristics may establish the genuineness or forgery of a typewritten instrument and when admitted in evidence is sufficient proof.

The occurrence of similar irregularities in typewriting in two or more machines is practically impossible. The rule that the typewriter creates for itself a certain distinctive character of writing which identifies one certain machine from all other machines is well-established. To prove that two instruments were written on a particular typewriter similar coincidence of characteristics must be shown in both instruments, and these coincidences considered collectively must demand a single conclusion.

In "*Typewriting Identification (Identification System for Questioned Typewriting)"* by Billy Prior Bates, the conclusion of the principles is stated thus:

Conclusion.—Typewriting identification is based on the same principle underlying handwriting identification, or any other thing which has a great number of possible variations.

The identification of a typewritten document can be likened to the identification of a particular person, A person may be identified in general by his sex, size, features,, and in addition, for example, by a radical mastectomy scar. A typewriter may be identified in general by characteristics such as type, design and size, possessed by all machines of a specific make and model, and in addition, for example, by a flaw in the serif on the letter E.

No opinion as to identity should be based upon only a few dissimilarities (or similarities). It is the combination of measurements and characteristics which all together make up the conclusion.

When good, clear specimens are available in sufficient amount for a scientific identification of the twelve points of comparison, it is possible to show with absolute certainty that a document was, or was not, produced by a particular machine.

The mathematical probability of the same combination of these characteristics divergent from the norm appearing in two machines is practically nil. The evidence of the twelve points of comparison can be conclusive proof.

It is, therefore, clear that the examination of typewriting and identification of the typewriter on which the questioned document was typed is based on a scientific study of certain significant features of the typewriter peculiar to a particular typewriter and its individuality which can be studied by an expert having professional skill in the subject and, therefore, his opinion on that point relates to an aspect in the field of science which falls within the ambit of section 45 of the Indian Evidence Act. Such opinion evidence of experts in the field has long been treated as admissible evidence in similar jurisdictions like the United States as is evident from these standard textbooks on the subject.

In the present case, even without resort to the word "handwriting" in section 45 to include typewriting therein, in the view we have taken, the word "science" is wide enough to meet the requirement of treating the opinion of a typewriter expert as an opinion evidence coming within the ambit of section 45 of the Evidence Act. We may, however, add that the long accepted practice of judicial construction which enabled the reading of the word "telegraph" to include "telephone" within the meaning of that word in Acts of 1863 and 1869 when telephone was not invented, would also be available in the present case to

read "typewriting" within the meaning of word "handwriting" in the Act of 1872. This is so because what was understood by handwriting in 1872 must now in the present times after more than a century of the enactment of that provision, be necessarily understood to include typewriting as well, since typing has become more common than handwriting and this change is on account of the availability of typewriters and their common use much after the statute was enacted in 1872. This is an additional reason for us to hold that the opinion of the typewriter expert in this context is admissible under section 45 of the Indian Evidence Act.

As a result of the above discussion, we hold that the observations made in the above extract in the decision in *Hanumant* on the basis of a concession does not reflect the correct position of law on this point and should, therefore, be treated as no longer good law on the point.

For the aforesaid reasons, we hold that the opinion of the typewriter expert in the present case is admissible under section 45 of the Evidence Act and the contrary view taken by the trial court and the High Court is erroneous. This appeal is accordingly allowed, and the impugned orders of the trial court and the High Court are set aside.[187]

187. *State (through CBI/New Delhi) v SJ Choudhary*, AIR 1996 SC 1491 : 1996 AIR SCW 1128 : 1996 Cr LJ 1713.

CHAPTER 11

POISONS & POISONING

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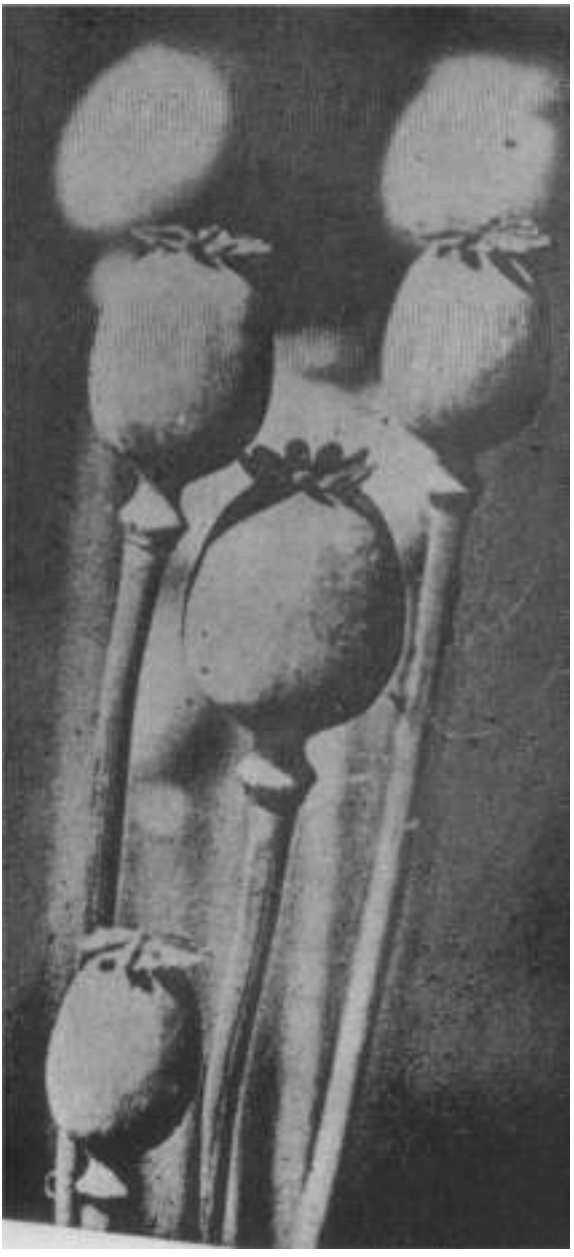

Fig. 11.1

The portion of the poison, which is found in the stomach, is not that which caused death but the surplus of the quantity which has already produced the fatal effects by its absorption in the system.

—Orfila

11.1 IMPORTANCE

Poisons are frequently involved in homicidal, accidental, or suicidal deaths. They are sometimes used to destroy animals and plants. The detection of poisoning and their identification is an important aspect of forensic science.

The investigation of cases of poisoning is one of the most difficult tasks for the reasons:

1. The quantity of a poison required to kill a victim is extremely small in some cases. For example, the fatal dose of nicotine is about 50 milligrams. On administration, it gets mixed in about 50 kilograms of body material. Thus, there is only one milligram in one kilogram of the body material. The analyst has to search for one part per million parts of the body material.
2. He is not only to detect it but also to estimate its quantity, to determine whether a fatal dose was administered to the victim or not.
3. The metabolism of the poison destroys the original form of the poison. The metabolites may not be amenable to detection/estimation.
4. Most of the poisons are easily available. The poisoner has easy access to them.
5. They are easily administered through food and drinks.
6. Symptoms of some poisons correspond to symptoms of some diseases. The victim and his near and dear ones think that he is suffering from some ailment. For example, the symptoms of strychnine poisoning correspond mostly to Diarrhea.
7. Poisons are administered in secrecy after winning the confidence of the victim.
8. The variety of poisons available is legion.
9. The ever-increasing numbers of synthetic drugs, which are used as poisons, aggravate the problem further.
10. Some drugs are very close to one another in their chemical and physiological behaviour. Their identification requires the most refined analytical techniques and an experienced analyst.
11. Body material, in which the poisons are found, is a complex mixture of organic, inorganic and biological substances. They interfere in the isolation, detection and estimation of the poisons. In fact, the most difficult task of a toxicologist is to isolate the poison in pure form. Once it is done, it is comparatively easier to identify and estimate the quantity.

11.2 NATURE

A poison is a substance, which on ingestion, inhalation, absorption, injection, or development in the body, in relatively small amounts may cause structural or functional disturbance to the body to injure health or to destroy life. In fact, any substance can act as a poison when taken in excess. Food materials (e.g., salt) and other substances may act as poisons. However, in Forensic toxicology, poisons are those substances, which are harmful even in small amounts.

The enacted law does not define "poison". However, legally, poisoning is established if it is proved that:

1. A substance (poison, stupefying or intoxicating agent or an unwholesome drug) was administered with the intention to cause hurt or knowing that the substance was likely to cause hurt.
2. There were witnesses who saw the victim consuming the poison.
3. There is no evidence of disease in the victim before or after death.

11.2.1 Administration

The most frequent method of administration of poison is through food. The poison is mixed in sweetmeats, cooked food, or a drink. It is substituted for a medicine. The victim is made to inhale a poisonous gas or vapours from a poisonous liquid. Or, the poison may be injected into the body.

> *A lady doctor was found dead in the hospital quarters with a hypodermic needle still in her left arm and the syringe lying by her side. Pheno-thiazine derivative (Siquil) and phenobarbitone were detected in the washings of the syringe and the needle. The drugs were also detected in the body of the deceased. (CH)*

A poison can be introduced through the vagina. It is done for causing abortion. Anus and skin pores are used for irritant poisons such as ground chillies. They are sometimes used to get confessions. Powdered chillies are also used to blind a person temporarily to rob him of his belongings.

> *A mother applied some medicine to the scalp and hair of her two daughters (aged 6 and 4 years) for killing lice. After some time the two children were given a bath. About four hours after the bath, both the girls were found dead. Zinc phosphide was detected from the hair and the viscera of both the deceased. (CH)*

11.2.2 Action of Poisons

11.2.2.1 Action mode

Basically, the action of most of the poisons is to prevent the supply of oxygen to body tissues. Failure of the availability of oxygen stops the normal functioning of the body, and the victim dies. The mode of this blocking oxygen to the brain varies. Examples:

1. In carbon monoxide poisoning, the gas combines with haemoglobin, the oxygen carrier, blood and thus, blood is unable to carry oxygen to various parts of the body.
2. The glycoside poisons, Digitalis affects the heart and the pumping of blood for circulation stops.
3. Opium and its derivatives/alcohol/ barbiturates paralyse the respiratory centers, stopping the breathing.

The action of poison may be local or remote. For example, strong acids and alkalis destroy parts of the body with which they come in contact. They are local poisons.

Alcohol, opium and its derivatives affect the victim when they enter the bloodstream. They are known as remote action poisons. Some poisons have both local and remote actions.

Most of the poisons affect the victim immediately. If the person survives for some time, the poison is eliminated through body excretions (vomitus, purges). However, some poisons accumulate, overtime, in the body, and when a certain level is reached, the person dies. Arsenic and some other metallic compounds are such poisons. It is for this reason that Arsenic has been a favourite with criminals through the ages. It is still used as a homicidal poison in India.

Most of the metallic poisons accumulate in the body.

11.2.2.2 Factors affecting Action of Poison

The action of poison is dependent upon a number of factors. The important ones are:

1. **Habituation;** an individual may have developed the habit of taking poisonous substances. For example, some snake charmers get snakebites regularly. Thus, they become immune to snake bite poisoning; some, *sadhus*, living away from civilization take arsenic regularly. They remain unaffected by the usual fatal doses of arsenic. It is said that kings in the olden days used to take Arsenic to prevent Arsenic-poisoning. Addiction to liquor, cannabis, and opium has a common phenomenon. The addicts are unaffected by the usual fatal doses of the materials they intake.

2. **Dosage**; the dosage of poison has a significant bearing on its action. The smaller the dose, less troublesome is the action. The minimum fatal dose, of course, varies with the nature of the poison and the individual.

   Nine children were affected due to ingestion of whooping-cough mixture, six of them died in hospital. Sodium nitrite detected in the cough mixture was far in excess of the expected quantity. Nitrite was also detected in the stomach wash as well as in the viscera of the victims. (CH)

3. **Administration mode**; the method of administration of the poison is an essential factor in the action of poisons. Those poisons, which are directly injected into the bloodstream, have an immediate effect. Those, which are administered through food, may get eliminated through vomit and diarrhea. Those inhaled (with air or alone) may get absorbed in the bloodstream and affect the victim almost immediately.

   Snake venom is a deadly poison when injected into the bloodstream. The victim may die. If this poison is taken orally, it is practically harmless, unless, of course, the venom enters in the blood through some wound in the mouth, throat, or food canals. It is for this reason that some people suck out the venom from the bite with mouth if a breast pump is not available for the purpose.

4. **Victim's health**; the health/age/allergy to the poison of the victim has a profound effect on poisoning. As a rule, the weaker the person is, the quicker and severer the action is. Thus, children/ old persons are affected more easily and more severely than young and healthy adults are.

5. **Physical state of the poison;** the physical state, whether the poison is solid/liquid/ gaseous, influences the effect of the poison. Even in solid state, whether the poison is in fine coarse or emulsified affect the action. Whereas 30 grams of ordinary mercury is not dangerous when compared to 0.06 grams of emulsified mercury is.

6. **Empty Stomach;** a poison taken orally in empty stomach, has quicker and severer effect.

7. **Unusual substance;** an unusual substance may upset the stomach of some persons. They eliminate the poison through vomits and diarrhea.

11.2.2.3 Fatal Poisoning

Table 1 gives the name of common poisons, their fatal doses, and fatal reaction time:

Table 11.1

Fatal Doses of Poisons

Poison	Fatal dose	Fatal period
Abrus Precatorius	Extract from 0.l g seeds (by injection)	3 to 5 days
Aconite	1.0 to 2.0 g of root	1 to 5 hours
Alcohol (Absolute)	250 to 500 ml	A few hours
Arsenic	0.1 to 0.2 g	one-second to 2 days
Atropine	0.1 to 0.2 g	One day
Barbiturate	4 to 20 g	A few hours to several days
Barium Carbonate	4 g	A few hours to several days

Cannabis (bhang, ganja and charas)	Resin extract toxic	Usually non fatal
Carbon monoxide	30% saturation	30 minutes in an atmosphere of 1% CO, 4 hours in an atmosphere containing 0.25% CO
Caustic alkali	5 g	Within 24 hours or longer
Chloral hydrate	3 to 5 g	Few minutes to few days
Chloroform	Usually 30 ml	Few minutes to few days
Copper sulphate	15g	1 to 3 days
Cyanide	0.1 to 0.3 g (of KCN)	Few minutes to 24 hours
Dhatura	1.5 g seeds	Within 24 hours
D.D.T.	2 g onwards	Few hours to few days
Endrine	0.6 to 1g	2 to 3 hours
Ergot	varied 2.5 g onward, 0.5 to 1.5 mg of ergotamine injection .26 mg of ergotamine orally	1 to 7 days
Gammexene	12 g	
Heroin	0.2 g	
Kuchila	One powdered seed	1 to 2 hours
Lead salts	Not known	One day to several days
Madar (Aak)	Not known	A few hours
Mercury salts	0.2 to 0.5 g	Few hours to several days
Mushrooms	Uncertain	One day to several days
Methyl alcohol	30 to 250 ml	1 to 4 days
Nicotine	0.06 g	A few minutes
Nitric acid	5 to 10 ml	A few hours to several days.
Oleander (Kaner)	8 to 12 seeds	A few hours
Opium	1 g Crude Opium, 0.25 g morphine by mouth or 0.03g morphine by	A few hours to a few days
Organo phosphorus insecticides	injection 0.1 g to 0.2 g	A few hours
Oxalic acid	4 to 16 g	A few minutes to few hours
Quinine	Uncertain	A few minutes to several days
Snake venom	0.02 g (injection)	A few days
Strychnine	0.05 g	Within 2 hours
Sodium nitrite	2 g	30 minutes to 3 hours
Sulphuric acid	4 ml	A few minutes to several Weeks.
Zinc phosphide	0.8 g	Within a day

Notes.—

1. The fatal doses are only approximate. They vary with individuals, their health, their reaction (vomiting!), the period over which they are administered and the mode of administration.

2. The list is not exhaustive. For example, it does not include:
   - Phenols, formalin, cocaine, some poisonous plants of known and unknown nature and industrial solvents.
   - The hypnotics, tranquilizers, mandrax, meprobamate, diazepam and even LSD which are now not uncommon in India.
   - Slow poisoning on the mass scale due to atmospheric pollution, adulteration of foodstuffs, radiation and effects of war gases.

11.3 CLASSIFICATION

Different persons, concerned with poisons classify them in many ways. For example, poison may be organic, inorganic, or biological material.

11.3.1 Inorganic Poisons

An inorganic poison may be a metal, a metalloid, a non-metal element, an acid or a base, an oxide or a salt. It may be a gas, a liquid or a solid. Common poisons of this category are arsenic, antimony, lead salts, mercury salts, strong acids, strong alkalis, cyanides, fluorides, carbon monoxide, hydrogen sulphide, chlorine, bromine, iodine, and phosphorus.

Three patients died during intra-venous saline drip in a hospital. Barium was detected in the viscera of the deceased. The 'saline' being injected and the saline bottles lying in stock were found to contain barium chloride solution instead of saline containing sodium chloride. (CH)

Firearm shooting instructors, working in indoor firing ranges, suffer from lead poisoning, as in shooting lead vapours are released in the air.

11.3.2 Organic Poisons

Organic poisons include the ever-increasing synthetic drugs, alcohols, petroleum products, insecticides, chloro compounds (especially chloroform), aromatic and organo-phosphorus compounds.

Some dockworkers, while unloading copper ingots from a cargo ship developed giddiness and vomiting. They were rushed to hospital, where one of them died. Blood from the surviving labourers showed the presence of methaemoglobin. The viscera of the deceased person showed the presence of nitro aniline. The copper ingots, they handled, were stained with some yellow material which on examination was found to be p-nitro aniline. Some bags stored along with the ingots contained p-nitro aniline. (CH)

11.3.3 Biological Poisons

The biological poisons include all poisonous plants and their parts (leaves, bark, seeds, fruit, stems and roots) and extracts from these plants. The well-known poisonous materials from plants are opium, strychnine, cocaine, atropine, cannabis resin, nicotine, cardiac glycosides (digitalis), aconite and many more. Another set of biological poisons come from the animal kingdom. Snake venom and other toxins are the important ones. They have not been used for criminal purposes to any appreciable extent. However, they cause numerous accidental deaths and it is a field with vast potentialities.

Poisons have also been classified according to their misuse. Thus, there are homicidal poisons, suicidal poison; or, accidental poisons, which are often involved in poisoning incidents.

11.3.4 Homicidal Poison

Homicidal poisons are misused to kill persons. Some common homicidal poisons are arsenic, aconite, opium, and potassium cyanide.

11.3.5 Suicidal Poisons

The poisons commonly used to commit suicides are called suicidal poisons. Usually, a suicide uses any poison easily accessible to him. Barbiturates, opium, arsenic, pesticides, and insecticides are such poisons.

A person working in an electroplating factory consumed electroplating liquid in order to commit suicide. Post-mortem examination revealed highly congested stomach. Chemical examiner found presence of Copper sulphate and cyanide in the viscera. The chemicals were also present in the sample liquid seized from the factory. (CH)

11.3.6 Accidental Poisons

Accidental poisoning occurs due to:

1. Poisons are mistaken for food articles or medicine.
2. The gas valve is not enclosed. Or, the raw coal is allowed to burn in closed rooms.
3. Careless handling of poisonous materials like insecticides/herbicides/pesticides.
4. Overdose of a medicine, like barbiturates.
5. Quack doctors prescribe wrong medicine.

Three separate persons took mag-sulf[1] *crystals from a chemist's shop for laxative use. After ingestion of the same two of them died. The viscera examination showed the presence of oxalic acid. When the Mag-sulph packet from the same shop checked, it contained oxalic acid instead of mag-sulf crystals. (CH)*

Poisons also are classified according to their effects. Thus, we have:

11.3.7 Cardiac Poisons

Cardiac poisons affect the heart. Digitalis and aconite cardiac poisons are the common examples.

11.3.8 Respiratory Poisons

The respiratory poisons affect the breathing organs. Poisonous gases, such as Sulphur dioxide, Carbon monoxide, Hydrogen sulphide, and Chlorine are the examples.

11.3.9 Nervous System Poisons

The nervous system poison affects the nervous system, such as (the brain, nerves, and spinal cord). Examples are opiates, strychnine, and hyoscine.

11.4 POISONING

The best/easiest way to kill a person and to get away with the murder, is poisoning.

Many poisoning cases remain unreported and uninvestigated. This is because the offence is committed after winning the confidence of the victim. If the poison for administration is selected /administered carefully, even the victim may not suspect the crime.

The first requirement in any investigation of a poisoning case is to establish the *corpus delicti*. Answers to the following questions help to fix it.

1. Trade name form magnesium Sulphate.

1. Was the victim healthy, free from any disease?
2. Was the attack of 'sickness' sudden or slow?
3. What was the time interval between the onset of the attack and the death/recovery?
4. What did the victim eat/ drink just before the attack?
5. What was the time interval between the taking of the food or drink and the onslaught of the sickness?
6. Was the leftover food/drink normal? Or, did it contain some poison?

   Some people from Ratnagiri complained of vomiting after taking cooked rice. The rice used for the preparation had been purchased from a ration shop. Endrin was detected in their vomitus and in the rice sample from the shop. (CH)
7. Did any other person(s) take the same food? If so, what was the effect on them?
8. Was the smell of the breath of the victim abnormal?
9. Were the excretions (vomit, purges and saliva) of the victim abnormal?
10. What were the observations/diagnosis/impressions of the doctor the poisoning incident?
11. Was the victim under any financial/emotional/physical stress?
12. Did the victim have suicidal tendencies?
13. Did the victim, his relatives, friends or enemies purchase any poison in the recent past?
14. Did the victim, his relatives or other acquaintances have access to poisonous materials?
15. Did the victim handle poisons/dangerous materials in the course of his duties/ hobbies?
16. Did he ever suffer from sudden attacks of illness?
17. Did the victim suffer from pains or other disabilities?
18. How did the victim act or behave before death/unconsciousness?
19. What were the symptoms before/after the collapse?
    - Did he feel difficulty in breathing or did he vomit or purge?
    - Did he show abnormal physical signs such as convulsions, delirium, paralysis, papillary changes, cyanosis or drowsiness?

Insecticides, pesticides, and dangerous drugs are easily available in India. They are often used for homicide/suicide crimes. They also cause accidental deaths. Organo-phosphorus pesticides have become notorious in this regard, in current times.

11.5 LOCATION AND COLLECTION

The main sources for the evidentiary clues in poisoning cases are:

1. The scene
2. The onlookers, participants, attendants; they observe the activity or body condition of the victim.
3. The victim
4. The doctor who treated the victim
5. The drug store, the chemical stores, herbarium,

6. The autopsy surgeon
7. The culprit
8. The vehicle used for transportation

11.5.1 The Scene

The evidentiary clues collected from the scene are varied in nature:

1. Vomitus
2. Purged material
3. Urine/faeces or their stains.
4. Clothes, bedsheets, and bed covers
5. Medicines, the victim or his family may be using.
6. All containers of medicines
7. Remnants of food or drink which the victim might have taken or discarded, including sugar, salt, spices, flour, baking powder and cooking recipes
8. Containers of food and drink, bottles and tins, found at the scene/garbage
9. Utensils used for cooking/eating
10. Solids and liquids contained in traps of the sinks

11.5.2 The Victim

The victim may be alive or dead. In both cases, he is the most important direct source of poison. The evidentiary clues may be on his person or on his garments. The materials that are collected from the deceased are:

1. Clothes
2. Stains, if any
3. Autopsy material

11.5.2.1 Autopsy Materials

For the detection of poisons and toxicological examination, the following autopsy materials are collected:

1. **Blood; i**t is the most important autopsy material. About 50 ml of blood is collected from artery/vein/heart or from the chromic gutter. Spilt blood at the scene is not collected.
2. **Urine; i**t is the second best toxicological material. The total amount of urine is collected through a urethral catheter or on opening, the bladder is punctured and urine is collected.
3. **Stomach contents; i**t is the most important toxicological material. The total contents of the stomach are collected.
4. **Intestines with contents**; 30 cm of intestines are collected.
5. **Liver/gall bladder with its contents**; 100 g
6. **Kidneys;** half of each kidney
7. **Spleen; h**alf in adult and whole in children

8. **Bile**
9. **Lung** (in cases of volatile poisons): Tied at the open ends
10. The following materials are also helpful:

1)	Brain	= whole
2)	Lung	= one
3)	Heart	= whole
4)	Muscles	= 500 g
5)	Bone	= 500 g
6)	Hair and nails	= 10 g (or 20 to 100 hair)

Bones, hair, and nails are useful for chronic metal poisoning. Lung, heart, and brain are helpful for gaseous and volatile poisons. Muscles prove useful in a putrefied body. Muscles are resistant to putrefaction and are not easily decomposed.

11.5.2.2 Non–fatal Cases

In non-fatal poisoning cases also, the victim is the most important source of evidence. He can give information on the various food, drink or smoking items, which may have initiated the onslaught. He is the best source to describe symptoms. In addition, the following articles are sent for toxicological examination in such cases.

Purges and vomitus, if any

1. Saliva and other excretion stains, if any
2. Urine: Whole amount
3. Stomach washings
4. Blood 50 ml, preferably more
5. The stains bearing clothes
6. Residual food, drinks, drugs, medicine, containers,

11.5.2.3 Reports and Opinions

The following documents are also sent to the toxicologist:

1. **Statement of the victim; i**t contains his opinion relating to the nature of poison(s), the symptoms and its effect, if any.
2. **The statements of witnesses, if any**. They reveal action/behaviour of the poisoned victim.
3. **Post-mortem/medico-legal reports; t**hey are the most important documents. They are sent along with the findings of the medico-legal expert.
4. **Treatment report;** the statement/report of the doctor, who treated the victim before his death, is sent along with the treatment chart and medical history of the victim.
5. **The investigating officer's report;** it gives the facts about the purchase, storage and handling of poisons.
6. **Copy of the FIR**
7. **Examination request letter**; it contains details of the exhibits and the nature of the examination required.

In addition to the usual precautions required in handling, packing, and dispatching putrefied materials (blood and stomach contents) need special care:

1. They are stored in cold rooms/freezers.
2. They are dispatched at the earliest.
3. The only preservative used for viscera is common salt. If acids are suspected to be the poisons, no preservative is used.
4. The name of the preservative used is mentioned.
5. The packing of the materials is done in such a way, that the material does not spill over, the container does not break, and the contents are not contaminated due to breakage, seepage or dirty containers.

11.6 THE PROBLEMS

The investigating officer should aim at finding answers to the following questions from the concerned persons:

1. Was the victim poisoned?
2. What was the name/nature of the poison administered?
3. When was the poison administered?
4. What was the source of poison?
5. What was the dose of the poison administered?
6. How was it administered?
7. Did the victim die of poisoning? Or, did he die of some other cause?
8. Was there some contributory cause, to cause death?
9. Was only one/or more than one poisons administered?
10. Was the poison given in single/multiple doses?

A female took some liquid from a bottle to commit suicide. While still in a semi-conscious state, she breast-fed her six months old baby. Both mother and baby died. Eldrin was detected in the remnants of the bottle and viscera of the deceased. (CH)

11.7 EVALUATION

The isolation, identification and estimation of poison from the autopsy material are complex and daunting tasks, especially if the analyst has no background knowledge of the poisoning case. It is, therefore, necessary to acquire the necessary background before starting the analysis.

11.7.1 Residual Poison

Residual poison at the scene of the crime, with the culprit or at the source of procurement makes it comparatively easy to identify, isolate, and estimate the poison.

If the poison has been administered through food or drink, it is easier to search for the poison in the residual food or drink.

11.7.2 Medico-legal Examination

The observations of the doctor indicate certain poisons:

1. Strong acids and alkalis cause burn wounds in the mouth, tongue, throat of the alimentary canal, and stomach. They, thereby, perforate, soften and ulcerate the tissues on coming in contact with them. The colour of the tissues changes from normal to red, reddish-brown or even black. Nitric and picric acids may change the skin yellow. Food materials can also bring about changes in colour. In the latter case, however, inflammation of tissues will be absent. Disease, putrefaction or both may bring about perforation and ulceration, change in colour, softening of the flesh tissues. The medico-legal expert finds the correct cause.
2. Alcohol, carbolic acid, chloroform, ether, opium, hydrocyanic acid, and yellow phosphorus emit a characteristic smell, which may give an indication about their identity.
3. Dhatura, aconite, alcohol, nicotine, atropine, hyoscine and belladonna dilate pupils. Opium alkaloids and chloral hydrate contract them.
4. Iodine reacts with starch in the food to give violet colour.
5. Powdered glass, metallic powders or plastic material may be found sticking to the surface (mouth, food canal, stomach and intestines) coming in contact with them.
6. Fragments of leaves and the bark of poisonous plants are found in the viscera, sometimes.

11.7.3 Symptoms

Symptoms often indicate the nature of poisons:

1. **Vomiting; s**ome irritating poisons like arsenic, acids, alkalis, excess of liquor and certain metallic salts cause vomiting
2. **Diarrhoea; s**ome poisons cause vomiting/diarrhoea.
3. **Cramps:** metallic poisons like arsenic, antimony and lead cause cramps.
4. **Delirium;** dhatura, cannabis, alcohol, atropine, hyoscine and LSD cause delirium.
5. **Convulsions;** strychnine, nicotine and cyanides cause convulsions.
6. **Paralysis; s**nake venom, aconite and arsenic cause paralysis.
7. **Coma; b**arbiturates, opium and its products, carbon monoxide, chloroform and excess of liquor, snakebites may cause coma.

Certain diseases also give similar symptoms. They, therefore, are only rough indicators.

11.7.4 Isolation

The isolation of an unknown poison from viscera and other body parts requires systematic processing. Usually, it involves the following steps:

1. The visceral material is hashed into slurry.
2. The slurry is divided into three to six equal parts.
3. One part is weighed and acidified. It is steam distilled.
4. The residue from the part is made alkaline and steam distilled again.

Volatile poisons, gases, alcohols, phenols, phosphorus, organic liquids and solvents (basic, acidic, neutral) are distilled over in steps (3) and (4).

5. The individual volatile poisons are tested in the distillates.
6. The non-volatile organic compounds are then extracted. A weighed portion of the material is acidified. It is saturated with ammonium sulphate and filtered. The filtrate is extracted with chloroform. The extracts contain acidic and neutral organic compounds.
7. The acidic aqueous layer left after the extraction, is made alkaline and again extracted with chloroform or ether. The solvent extracts basic organic compounds.

Steps 6 and 7 extract all organic compounds. The quantity extracted depends upon their relative solubilities in the two media and also upon the thoroughness of the extraction technique.

The main difficulty is interference by fats and proteins. They are precipitated by ammonium sulphate, sodium sulphate, or by other techniques and the precipitate removed. There are modifications of the original method suggested by Stass and Otto more than a century ago.

Isolation of metallic poisons is done through one of the two oxidation processes: wet and dry.

In the wet process, the organic matter is destroyed by hydrochloric acid and potassium chlorate or by nitric acid and sulphuric acid mixtures. An excess of oxidizing agent is used for complete oxidation. Thus, after the destruction of organic matter, only inorganic anions and cations are left.

In the dry process (used only when the metallic poison is non-volatile) the material is burnt to ash and the ash is tested for the suspected metal poisons.

Isolation and identification of plant materials (leaves, root, bark,) is a difficult job. Identification is done by the microscopic study of the viscera and related materials. Quantitative separation of vegetable matter is difficult. For the identification of active principles both chemical and biological methods are used.

Microscopy of the visceral mass reveals certain inorganic materials, like glass and other similar irritants. Some particles are handpicked.

11.7.5 Classical Identification Techniques

The following conventional techniques are employed extensively for the identification of poisons:

11.7.5.1 Colour tests

Some colour tests are very sensitive and can detect a class of poisons in minute quantities. These reactions are often not specific for an individual poison.

11.7.5.2 Melting points

Melting points of an organic substance are often characteristic. For confirmation mixed melting point is taken. The suspected poison is mixed with an authentic sample, and if the melting point is not depressed, the identity of the suspected poison is established.

The greatest difficulty in toxicology is to procure the poison in sufficiently pure form to get the melting point, even within a close range. Once the substance is guessed, the mixed melting point even with not so pure a sample establishes the identity.

11.7.5.3 Boiling points

The liquid poisons are identified by their boiling points. Some heavy oils and high boiling point liquids are distilled under reduced pressure. Reference to standard boiling points of liquids indicates the identity.

11.7.5.4 Crystal structure

Most of the substances or their derivatives have definite crystal structures. The substances or their derivatives are crystallised, and the crystal structure is studied.

11.7.5.5 Microscopy

Vegetable materials, such as seeds, flowers, leaves, bark, wood fragments, and root particles are identified through microscopy or through their physiological effects. Likewise, some biological materials are identified through microscopy.

For metallic poisons, the following general tests for metals are used in toxicology:

11.7.5.6 Reinsch test

It is a good screening test. A copper wire, foil, or strip is placed in boiling dilute hydrochloric acid solution of the product. A grey-black deposit indicates arsenic, antimony, bismuth and mercury metals, which are identified by individual tests. For example, for arsenic, the grey black copper foil is cut into small pieces, taken into a Reinsch tube and heated over a low flame. Characteristic octahedral crystals of arsenic oxide are seen on the cold part of the tube under a microscope.

11.7.5.7 Dithizone

It is a more or less universal reagent to give coloured complexes with heavy metals. The reagent is dissolved in chloroform, and the product is shaken with the solution containing metallic poison from the viscera. The reagent in the chloroform takes up heavy metals, which are identified by individual tests.

11.7.5.8 Spectrography

Ash obtained in the dry oxidation process of viscera or the product collected by any of the above processes is spectrographed. The elements are identified from their characteristic spectra. The amount is estimated from the densities of the lines if a weighed quantity is used for the analysis.

The criminals frequently use alkaloid poisons. They are detected by the following general tests:

11.7.5.9 Mayer's reagent

Potassium mercuric iodide prepared under specific conditions precipitates most of the alkaloids.

11.7.5.10 Wagner's reagent

Iodine in potassium iodide solution precipitates most of the alkaloids.

11.7.5.11 Phospho acid reagent

Phosphotungstic or phosphomolybdic acids form yellow precipitates with alkaloids. Tannins, platinic acid, picric acid, gold chloride also precipitate alkaloids.

11.7.6 Modern Techniques

In recent decades, many sensitive techniques are used in a toxicological analysis. They are dependable, and the degree of purity required for their examination is not very high. Besides, the techniques are sensitive, specific and require only minute quantities. They, however, involve costly equipment, advanced training in the handling of the equipment and sufficient experience in the work to interpret the results correctly.

> *Some years ago, a labourer went into a pit to clean it. Suddenly he collapsed and died at the spot. It was suspected that the pit might have had some poisonous gases inside. The worker must have died by inhaling them. The responsibility for his death and hence for compensation would then fall on the factory management. However, if the worker had died of heart failure, his family would get compensation from his insurance company. It was, therefore, necessary to determine whether the worker died of heart failure or poisonous gases in the pit.*
>
> *At the autopsy, a bubble of air (gases) was collected from the lungs of the deceased. The same was analysed by a mass spectrograph (a costly and highly sophisticated instrument). Complete data about the nature and quantities of the constituents of the air bubble were obtained. It corresponded with the standard air composition. The analysis established that the man did not die from gas poisoning as was originally suspected. Heart failure was declared as the cause of his death. (CH)*

Some of the important techniques are:

11.7.6.1 Chromatography

Thin Layer Chromatography (TLC), Gas and Liquid Chromatography (GLC) and High Performance Liquid Chromatography (HPLC) are being used increasingly in toxicology:

- TLC is a method of choice with all toxicologists. It is simple, inexpensive, quick, fairly accurate and applicable in most of the cases. Besides, the sample need not be pure as the process itself 'purifies' the sample.
- In gas chromatography, a measured amount of the substance to be tested is injected into the column head placed in a heated chamber where it is vapourised or pyrolysed. A carrier gas takes the product through a separating column containing a stationary phase. The constituents of the product are separated due to differential adsorption/de-adsorption as they travel through the column. The separated entities are then passed through a detector, which is connected to an automatic recorder. The constituents produce changes, which are amplified and recorded on the chart of the recorder. The chromatogram, thus obtained, is compared with chromatograms of standard suspected compounds for identification. Quantitative estimation is made from the peak area, automatically given by an integrator, attached to the instrument.
- The technique is being used increasingly for gaseous, liquid and volatile poisons. The poisons which pyrolyse to give identifiable products (e.g., barbiturates), have also been identified and estimated by the technique.
- In high performance liquid chromatography, a liquid instead of a gas is used as the carrier. Thus, the technique is used for non-volatiles poisons.

11.7.6.2 Mass Spectrography

Mass spectrograph has now become an excellent tool for the identification of poison in an extremely small amount. The instrument is coupled with GLC or HPLC. Almost all types of poisons, especially organics, are identified with the technique.

11.7.6.3 Spectrophotometry

Ultraviolet, visible light and infrared rays are employed in spectrometers for the detection, identification and estimation of a host of poisons. The sample to be identified is mixed in

a suitable substance (solid or liquid) and a beam of the rays (infrared, visible light rays or ultraviolet rays) is passed through the sample. The energy consumed depends upon the molecular structure of the compound. The absorption is recorded on a graph. The trace thus obtained is characteristic of the compound, like the fingerprints of a man.

UV spectrogram has been utilised for quantitative analysis also.

The technique has been made more sensitive by using F.T.I.R. instrument.

11.7.6.4 X-Ray Diffraction

The technique uses diffraction of X-rays when they are passed through the substance. The diffraction pattern depends upon the disposition of various groups and radicals in the molecule. The pattern is photographed and compared with known diffraction patterns to establish the identity. The comparison is now done by the computers, which carry the relevant software for such comparisons.

The technique is useful for both organic and inorganic poisons in powdered form.

The technique is used to identify barbiturates, alkaloids, glass and clays.

11.7.6.5 Neutron Activation Analysis (NAA)

When various elements are bombarded with neutrons they become radioactive. The extent and nature of radioactivity depend upon the nature of the element and its quantity. The activity is measured by spectrometers. The measurement gives both qualitative and quantitative analysis.

Neutron activation analysis is one of the most sensitive techniques known for analysis. It can detect and estimate quantities of elements as small as a picogram (10^{-12} g) specifically and accurately. It is used in the detection of metallic poisons, notably arsenic and lead in body tissues like hair and nails.

> *It seems that on St. Helena, Napoleon suffered from chronic arsenic poisoning it was decided to check the fact through Neutron Activation Analysis. Napoleon's hair, were kept in a French museum. They were used for the test:*
>
> *A hair weighed sample (1.72 mg) was sealed in a polythene container. The sample and a standard arsenic solution, sealed in silica, ampoule were irradiated by thermal neutrons for one day at 1012 neutrons per cm^2 per second in a nuclear reactor at the Atomic Energy Research Establishment, Harwell. The hair sample was compared with the standard arsenic by modified Gutzeit technique. The activity of the sample and the arsenic content of the hair were calculated.*
>
> *The value found for the sample of hair was 10.38 parts per million. This is high by comparison with the normal mean arsenic content of about 0.8 PPM. Unfortunately, it was not possible to make any distribution studies, as no further hair samples were available. (CH)*

11.7.6.6 Scanning Electron Microscopy

The scanning electron microscopy has come up in a big way to identify biological materials as the technique gives very high magnification that permits easy identification. It is used for the identification of cannabis and its products. With EDX, it is also used to identify and quantify metallic contents of the clue materials.

11.7.6.7 Radio Immuno Assay (RIA)

Radio Immuno Assay technique is exceptionally useful for materials in small amounts. It is applicable even to contaminated samples. Poisons in viscera are often in small amounts and contaminated. The technique is highly useful in such situations. The technique is sensitive, specific and rapid. The main advantage is that the materials do not require extensive pre-treatment. It is being used increasingly for the identification of poisons.

11.8 INDIVIDUAL POISONS

11.8.1 Arsenic

It is one of the oldest poisons known to man. It has been extensively used/misused through the ages to poison human beings, animals and pests.

11.8.1.1 Nature

Arsenic in the metal or metalloid form is not poisonous but its oxides are highly poisonous. Arsenic oxide, called Arsenic in common parlance, is a white tasteless and odourless powder. It is somewhat soluble in water. It is, therefore, administered in all types of foods and drinks.

It is potent poison. A pinch of the poison can kill two adults. A teaspoonful is sufficient to kill about a score of persons.

11.8.1.2 Use

Arsenic is extensively used in Ayurvedic medicine system for the treatment of syphilis, rheumatism and skin diseases. It is a strong insecticide. It is used as such for the preservation of wood, wallpaper and other articles.

11.8.1.3 Administration

For homicidal abuse, Arsenic is mixed with various food articles, cooked food, sweetmeats, sharbats (soft drink), milk, tea, coffee, liquor and medicines.

> *In a case from Firozabad, the victim was related to the accused and was living with him. He developed illicit intimacy with the wife of the accused. Subsequently, the accused administered poison in milk to the paramour. The victim died in less than three hours of taking the milk. The dead body was taken to cremation grounds and set on fire.*
>
> *In the meanwhile, the news of the suspicious death spread out. Partially burnt body was taken out from the pyre with the help of the police. Arsenic was detected in the viscera of the deceased. A white powder, recovered from the house of the accused, was identified as arsenic. (CH)*

Apart from foodstuffs, arsenic has been administered through tobacco and cigarettes. It has also been administered as holy water. It has been mixed in 'enema' fluid. It has also been injected into the vagina for abortion.

The poison is more effective in solution and dust form.

11.8.1.4 Symptoms

Arsenic poisoning has the following symptoms:

1. Giddiness and nausea,
2. Burning pain in the throat and stomach,
3. Salivation,
4. Vomiting, retching (they may save life),
5. Thirst,
6. Cramps,
7. Severe diarrhoea,
8. Convulsions,
9. Coma.

When a heavy dose is taken, it may cause immediate death without most of the above symptoms. Sometimes excessive vomiting eliminates the poison and the victim is saved.

Sometimes abnormal symptoms also appear. They are paralysis, maniacal behaviour, delirium and disorders in speech, memory, hearing and vision.

11.8.1.5 Post-Mortem Findings

The body may have shrunk. The eyes are usually found sunken. The mucous membranes of mouth, pharynx, stomach and intestines are sometimes found swollen and ulcerated. The stomach wall is often found embedded with arsenic particles and streaked blood.

Liver, spleen, kidney, and heart are all affected characteristically, which permit guess of the identity of the poison.

11.8.1.6 Fatal Dose: 100 to 150 mg

11.8.1.7 Fatal Period

- 2-3 hours in acute cases
- 12-24 hours in less acute cases
- In some cases, death occurs after a number of days.
- It is a cumulative poison; i.e., it accumulates in the body. When the accumulation reaches the critical stage, the victim dies. Thus it is used in slow poisoning Death may take months when Arsenic is administered in small doses.

11.8.1.8 Detection

The poison is detected through the following tests:

1) **Reinsch test**.—It is a good screening test. A copper wire, foil or strip is placed in a boiling dilute hydrochloric acid solution of the product. A grey black deposit indicates arsenic, antimony, bismuth and mercury metals, which are identified by individual tests. For example, for arsenic, the grey black copper foil is cut into small pieces, taken into a Reinsch tube and heated over a low flame. Characteristic octahedral crystals of arsenic oxide are seen on the cold part of the tube under a microscope.
2) **Marsh test**.—It is a very delicate test. The suspected substance containing arsenic-compounds is put in a vessel generating hydrogen gas (Woulffe's bottle). The gas, arsine is formed. It bums with a garlic smell and characteristic flame, depositing a light grey residue.
3) **Gutzeit test**.—A silver nitrate paper turns yellow if it is held in vapours coming out of a heated mixture containing arsenic, zinc and sulphuric acid.
4) **Bettendorf: reaction**.—Oxidized viscera is heated with stannous chloride and strong hydrochloric acid. Blackish precipitate indicates arsenic.
5) **Spectrographic analysis**.—Arsenic is also detected and estimated by spectrographic analysis.

11.8.1.9 Estimation

Quantitative estimation of arsenic is done by using the Marsh test, Gutzeit test, or spectrographic analysis. The Marsh test is considered the best all round tests for the purpose. Iodometric titration is useful after wet destruction of biological materials.

11.8.1.10 Toxicological Materials

1. Vomitus, purges
2. Blood, urine
3. Stomach contents
4. Intestines
5. Liver, kidney, spleen
6. Burnt bones and ash, in case the victim has been cremated.
7. Hair, nails and skin (especially scrapings from the soles of the feet). They are useful in slow poisoning.

11.8.2 Cyanides

Cyanides are among the deadliest poisons. They combine with haemoglobin of blood and stop the formation of oxyhemoglobin, the supplier/transporter of oxygen to the tissues.

11.8.2.1 Nature

The important members of this class are hydrogen cyanide, potassium cyanide, sodium cyanide, mercuric cyanide and silver cyanide. Cyanides are also widely, distributed in nature. Kernels of some stone fruits contain cyanide in significant quantities.

Double salts of cyanides (e.g., ferro- or ferri- cyanides) are practically non-toxic, provided hydrogen cyanide is not liberated from them.

11.8.2.2 Use

Cyanides are extensively used in industry, particularly in metallurgy of silver and gold, in hardening steel, in classical photography and in electroplating Cyanides are used as insecticides and in some pharmaceutical preparations. Cyanides are also used to kill diseased and unwanted animals and pets.

11.8.2.3 Administration

Cyanides are, ordinarily, used for suicidal purposes. They are taken as such or in food materials. The quick and almost painless death encourages their use for the purpose. Cyanides are also used through food for homicidal poisoning. Potassium cyanide is the commonest cyanide used as a poison.

> *A person got his imbecile nephew heavily insured. After about a month, he invited him for a drink and mixed potassium cyanide in his drink. The man collapsed and died immediately. (CH)*

Accidental deaths caused due to cyanide poisoning occur because of ingestion of cyanides mistaking them for medicine, inhalation of cyanide fumes from insecticidal preparations or from the excessive use of cyanide containing materials.

Accidental cyanide poisoning of cattle takes place when they eat plants containing cyanides in some form. Linseed and Juar Kadvi are notorious for the purpose.

Seven cattle were found dead in the vicinity of water effluent from an electroplating factory. Cyanide was detected in the effluent water sample and in the viscera of all the dead animals. (CH)

11.8.2.4 Symptoms

Cyanide is a potent poison, as mentioned earlier. It acts quickly. The effect/symptoms appear within a few seconds and the victim is dead within a few minutes. The symptoms are:

1. Bitter taste
2. Burning sensation
3. Smell of bitter almonds
4. Salivation
5. Giddiness
6. Numbness and oppression
7. Convulsions and paralysis

11.8.2.5 Post-Mortem Findings

1. Skin becomes red or violet in colour.
2. Hands and jaws are clenched.
3. Froth appears in the mouth.
4. Pupils dilate.
5. There is smell of bitter almonds.
6. Potassium cyanide is hydrolysed on intake into potassium hydroxide and hydrogen cyanide. Potassium hydroxide may, in addition, produce symptoms of strong alkali poisoning: inflammation and ulceration of the mouth, food tract and stomach, especially if a large dose of potassium cyanide is taken/ingested.

11.8.2.6 Isolation

The cyanide is isolated from the tissues and other biological materials by steam distillation of the acidified (with dilute sulphuric acid) solution of the slurry. The distillate is collected in a cold caustic alkali solution.

11.8.2.7 Detection

1) **Odour:** Characteristic odour of bitter almonds.
2) **Colour test**:
   - **Prussian Blue Test:** The solution containing cyanide is made alkaline with caustic potash, 0.5 ml of freshly prepared ferrous sulphate solution and a few drops of ferric chloride solution are added to it. The mixture is warmed and acidified with dilute sulphuric acid. Blue colour or a blue precipitate indicates the presence of cyanide.
     The sensitivity limit of the test is 0.2 microgram.
   - **Sulphocyanide Test:** The alkaline solution containing cyanide is treated with a few drops of yellow ammonium sulphide. It is then evaporated to dryness on

a hot water bath. The residue is dissolved in a few drops of dilute hydrochloric acid. It gives blood red colour with one drop of ferric chloride solution.
Its sensitivity limit is 0.25 microgram.

11.8.2.8 Estimation

The cyanide is estimated by titrating it against silver nitrate solution in the presence of dilute sodium hydroxide solution. End-point is noted with an acetone solution of rhodamine, which gives change of colour from yellow to pink.

1 ml of N/200 silver nitrate solution = 0.266 mg HCN
= 0.652 mg KCN
= 0.4915 NaCN

11.8.2.9 Toxicological Materials

1. Vomitus, purges
2. Blood
3. Viscera
4. Intestine
5. Brain matter
6. Liver

The accused and his wife, along with the victim, rented and occupied a room under false names and address in a hotel at Varanasi. They placed an order for four bottles of soda and ice, which were immediately supplied to them. About half an hour later, the waiter came back with potato chips, and knocked at the door. The woman partly opened the door and took the articles. After some time the waiter returned to collect the utensils and knocked at the door. As the woman unbolted the door, the waiter pushed the door open and entered the room. He saw the deceased lying unconscious on the cot. The couple told the waiter that the deceased was unconscious due to excessive drinking They also allured the waiter by offering him Rs 20 for not disclosing it to anybody. However, the waiter at once ran to the manager and told all. Meanwhile, the couple attempted to run away but were apprehended by the manager and handed over to the police. Potassium cyanide and alcohol were detected in the left over portions of the drink and in the viscera of the deceased. Traces of potassium cyanide were also detected in the vomit stains on the towel, shirt and vest of the deceased. A whisky bottle recovered from the scene of occurrence was found to contain a few drops of alcohol. (CH)

11.8.3 Copper Sulphate

Anhydrous copper sulphate is a white powder. It crystallises with water to give blue crystals.

11.8.3.1 Use

It is frequently used in industry, horticulture, and as a disinfectant in swimming pools and as medicine.

11.8.3.2 Administration

The administration of the poison is rarely homicidal. Accidental and suicidal intakes are comparatively more frequent. It is taken through the mouth either in pure form or mixed with food. It, however, can be administered through the vagina, rectum, and abraded surface and by injection.

11.8.3.3 Symptoms

1. Metallic taste
2. Burning sensation in the stomach
3. Salivation, thirst and nausea
4. Vomiting and diarrhoea
5. Convulsions and paralysis in severe cases
6. Coma and death

11.8.3.4 Post-Mortem Findings

1. Greenish blue froth.
2. Mucous membrane of alimentary canal is inflamed and ulcerated
3. Copper may be found deposited inside

11.8.3.5 Isolation

1. Viscera are incinerated in an electric furnace at 550° C and copper is detected in the residue.
2. Organic matter of the viscera is oxidized with sulphuric and nitric acids. The solution is then tested for the copper.

11.8.3.6 Detection

1. Copper salts in acidic solution give black precipitate with hydrogen sulphide.
2. Potassium ferrocyanide solution gives a chocolate brown precipitate with copper salts in acetic acid medium.
3. An acidic solution of copper salts deposits copper on an iron wire/strip.
4. Spectrography of materials containing copper gives reliable identification.

11.8.3.7 Estimation

The following methods are common for estimation of copper:

1. **Spectrography**
2. **Colourimetry**: Sodium diethyldithiocarbamate forms a complex with copper, which is soluble in amyl alcohol. It is estimated with a colourimeter from the solution from colour intensity.
3. **Iodometric titration** also gives reliable results.

11.8.3.8 Toxicological Materials

1. Vomitus, stomach washings
2. Stomach contents
3. Intestines
4. Liver, kidneys

11.8.4 Barbiturates

Barbiturates are hypnotics and sedatives. The number of these substances has increased tremendously in recent years. They are derivatives of barbituric acid. They are white, odourless and slightly bitter in taste. Fatal poisoning occurs due to excessive doses. They are frequently met with in suicide cases. In homicidal cases, they are given when the victim is drunk. Accidental barbiturate poisoning is rare.

> *A female was found dead in the bed. Some blood was seen near her mouth. She had taken bread and tea before going to bed. The nightgown and the bed sheet were stained with blood and there were also some brown stains, probably from tea. Barbiturate was detected in the bloodstains and the brownish spots separately. Barbiturate and ethyl alcohol were detected in the viscera and the post-mortem blood sample from the deceased. (CH)*

11.8.4.1 Classification

The barbiturates are classified according to the time they take to act on the body. Thus, we have:

1) **Long acting barbiturates**.—they are — Barbitone, Pheno-barbitone, Methyl Phenobarbitone, Commercially, the products are known as Medinal, Veronal, Gardenal, Luminal, Somonal, Prominal, The action of these barbiturates usually commences after an hour or more and lasts for 6 to 10 hours.

2) **Intermediate acting barbiturates**.—They are Allobarbitone, Butobarbitone and Amylobarbitone. Their commercial names are Dial, Amytal and Soneryl, respectively.

   The action of these barbiturates starts in about 30 minutes and their effect lasts for 5 to 6 hours. They are less likely to leave the patient sleepy the next day than the long-acting barbiturates. Therefore they are widely used against insomnia.

3) **Short acting barbiturates**.—They are Cyclobarbitone and Pentobarbitone. Commercial names are Phenedran, Cyclonal, Nembutal, Seconal. They are effective within 15 minutes and their action lasts for 2 to 3 hours only. They are especially suited for people who have difficulty in going to sleep.

4) **Ultra short acting barbiturate.—**They are Pentothal, Thiopentone sodium, Hexa barbitone. These are used as rapidly acting anaesthetics. They are given alone or in combination with inhalation anaesthetics.

11.8.4.2 Use

They are/were widely used in combination with other medicines to give relief from pain and to induce sleep.

11.8.4.3 Administration

Barbiturates are commonly given through the mouth but they are also injected.

11.8.4.4 Symptoms

1. Mental confusion
2. Coma, which may last for days
3. Muscular weakness
4. Death

11.8.4.5 Post-mortem findings: nothing characteristic

11.8.4.6 Detection

1. A few drops of Millon's reagent give a white precipitate.
2. Fusion with caustic soda gives out ammonia.
3. Melting points are characteristic.
4. The solution of barbiturates gives violet colour with isopropylamine and cobalt nitrate solution. Solutions are taken in absolute alcohol.
5. Thin layer chromatography gives characteristic R_f values.
6. UV and IR spectra are characteristic.
7. Gas chromatography gives characteristic traces of pyrolysed products.

11.8.4.7 Estimation

1. **Semi-quantitative method.** The area of the developed spot by the crime material on thin layer chromatogram is compared with the spot area of a known amount of the barbiturate.
2. By titrating the alcoholic solution of barbiturate with silver nitrate solution. The end-point is observed by the appearance of slight yellow turbidity.
3. By spectrophotometry and gas chromatography

11.8.4.8 Toxicological Materials

1. Stomach contents
2. Urine, blood
3. Kidney
4. Brain
5. Liver

11.8.5 Organo-phosphorus Compounds

The organo-phosphorus insecticides are deadly poisons. They are easily available. They are, therefore, being used increasingly for homicidal and suicidal purposes. The poisons are also involved in accidental poisoning.

11.8.5.1 Nature

Organo-phosphorus compound, like poisons, has become common only in the past few decades. They are alkyl and aryl phosphates. They are powerful insecticides and are deadly poisons. Important ones are: Folidoll (parathion), Tik 20 (Sumithion, diazinone), Malathion, Meta Systox, Rogor (Dimethoate), Dimecron (Phosphamidon), Fenitrothion, Fensulphothion, Thio-demeton, Dalf, Diptera, Baytese, H.E.T.P., T.E.P.P., O.M.P.A.

They are complex organic compounds containing sulphur, phosphorus and other organic radicals, mostly in the form of alkyl and aryl phosphate.

11.8.5.2 Use

These compounds are used extensively in agriculture and horticulture. They are also used to kill household bugs, flies, and other pests.

11.8.5.3 Administration

These Insecticides are administered through food and drinks. Their inhalation proves fatal. Some of them are easily absorbed by human skin. They can be injected.

11.8.5.4 Symptoms

1. Headache, giddiness and nausea
2. Salivation and vomiting
3. Diarrhoea, spasm, abdominal cramps
4. Mental confusion and delirium
5. Paralysis, coma and death

11.8.5.5 Post-mortem Findings

1. Nothing characteristic, though usual signs of asphyxial death are seen in many cases.
2. Kerosene oil like smell.
3. Pulmonary edema.

11.8.5.6 Isolation

Organo-phosphorus compounds are steam volatile. The tissues and other biological materials are acidified with phosphoric acid and steam distilled. The distillate is extracted with hexane, which on evaporation gives organo-phosphorus insecticide.

11.8.5.7 Detection and Estimation

- **Colour test**. Parathon, Sumithion having para-nitro-phenyl group, give yellow colour on heating with alkali.
- The nitro group in the compound is reduced to amino group, which after diazotisation and coupling with B-naphthol gives intense coloured dyes.
- **Thin layer chromatography (TLC)**. TLC on silica gel-G using rhodamine B spray, followed by exposure to bromine vapours, gives purple spots against white background. R_f values are characteristic for each individual organo-phosphorus compounds.
- **UV Spectrophotometry**.

A young girl of 20 years was residing with the warden of the working women's hostel in Lucknow. During the absence of the hostel inmates during the daytime, she was seen reading up to 4 pm. A female cook was also present in her room. In the evening she gave money to the cook to bring vegetables, and who, on returning, found that the room was bolted from inside and there was no response. The warden, on her return in the evening, got the door broken open and was surprised to find the girl dead. An organo-phosphorus insecticide (NOK 99) was detected in the viscera and in the vomit stained clothes and bedding The insecticide was also detected in the blood and faecal stains on the dhoti and petticoat of the deceased. (CH)

11.8.5.8 Toxicological Materials

1. Vomitus
2. Urine, blood
3. Stomach contents
4. Liver

Organic-phosphorus poisoning can be detected even in putrefied bodied.

11.8.6 Vegetable Poisons

Plant poisons are more frequently used in the East than in the West. The common vegetable poisons are derived from poppy, dhatura, oleander and Madar. Other important poisons derived from plants are strychnine (obtained from Kuchila, i.e., Strychnos nux vomica), nicotine (from tobacco), aconite (Mitha Zahar, from Aconitum napellus) and atropine (from Atropa belladonna). Besides, there is a host of other poisons, which are available in the plant kingdom and are used from time to time.

11.8.6.1 Opium

11.8.6.1.1 Nature

Opium is the dried juice of unripe white poppy heads. It is plastic when fresh and moist, but on complete, drying it becomes hard and brittle. It is dark brown in colour in the dried state. It is grown in many parts of the world, including India. Its cultivation is restricted in India and in most of the other countries. Usually, the governments supervise the cultivation and harvesting. However, smuggling of the opium from the licensed farms continues.

Opium is a complex mixture of alkaloids. The most important constituent is morphine, which is extensively used as such in the form of its salt. Its derivative heroin is used only illegally as its use is banned throughout the world. Other important alkaloids in opium are codeine, narcotine, papaverine and thebaine.

Opium is a habit-forming drug. It is not easy to give up the habit of taking opium, once it is acquired. Opium as such is used in India, while morphine, heroin and other derivatives are more common in Western countries. However, they are invading India also. Heroin is the most dangerous member of the family. Its use is illegal everywhere. "Smack" and "Brown Sugar" are other names of the crude form of heroin.

11.8.6.1.2 Use

Opium and its products are used extensively in all systems of medicine as painkillers, sedatives and as a narcotic.

> *A person aged 23 consumed liquid from a bottle labelled "Klesh Hari" (Pain Reliever). He died in a few hours on the way to the hospital. Alcohol and opium were detected in 'Klesh Hari' as well as in the viscera of the deceased. (CH)*

11.8.6.1.3 Administration

Opium, its constituents and their derivatives are ingested in many ways: orally, (alone or with food), by injection, and through smoking or inhalation. It is also possible to introduce them through wounds, rectum and vagina.

Opium is mostly used in suicides. Its bitter taste makes it unfit for homicidal purposes, though it is sometimes used for infanticide. Accidental poisoning by opium and its products is rather rare. It happens in cases where the addict may have exceeded his normal dose.

11.8.6.1.4 Symptoms

The effect of opium depends upon the quantity taken, health and habit of the individual and mode of administration. The following symptoms are common:

1. It causes excitement in the initial stage(s).
2. At the second stage, the person suffers headache, nausea and vomiting
3. In the third stage the person is drowsy, pupils contract and unconsciousness follow on taking more opium, which may end in death.

11.8.6.1.5 Post-Mortem Findings

The medico-legal expert finds:

1. Characteristic smell of opium; it is not present if the body has putrefied.
2. There are signs of asphyxia (froth in mouth and nostrils).
3. Opium is found in the stomach, in some cases.

11.8.6.1.6 Isolation

The slurry made from the viscera or other biological materials are treated with 5% acetic acid. Ammonium sulphate is used precipitate proteins. Material is heated on a water bath for about 6 hours. The filtrate is extracted with an organic solvent in an alkaline medium.

11.8.6.1.7 Detection

- **Huseman test**. A few drops of concentrated sulphuric acid are added to the dry residue are added and heated in boiling water bath for 30 minutes. After cooling, nitric acid is added to it. Red colour indicates opium.
- **Oliver's test.** The residue is taken in a few drops of dilute acetic acid. Two drops of hydrogen peroxide are added. A few drops of ammonium hydroxide are added to make the material alkaline. The resulting solution is agitated with a clean copper foil. When effervescence ceases the solution assumes wine red colour.
- **Meconic acid test.** Neutral solution of ferric chloride gives blood red colour, which persists even after the addition of dilute hydrochloric acid and mercuric chloride solution.
- Porphyroxin test. On heating the residue with dilute hydrochloric acid, it gives pink colour.
- Marquis reagent. It is: 2 ml concentrated sulphuric acid, containing 2 drops of formalin. The reagent gives purple-red to violet colour with opium.
- **Meck's reagent.** It is 1% selenious acid solution in concentrated sulphuric acid. The reagent gives brown to green colour.
- Thin layer chromatography (TLC). TLC gives characteristic R_f values for individual alkaloids of opium.

11.8.6.1.8 Estimation

The purified extracted residue is dissolved in neutral ethyl alcohol. A known volume of 0.02 N sulphuric acid is added to it and kept on a water bath. After 30 minutes the unreacted sulphuric acid is titrated against 0.02 N Na OH solution using methyl red as an indicator.

Each ml of 0.02 N-Sulphuric acid = 57.0 mg opium approximately.

11.8.6.1.9 Toxicological Materials

1. Vomitus
2. Blood, urine
3. Stomach contents
4. Intestines, liver, kidney, brain.

11.8.6.2 Dhatura

Dhatura (Datura fastuasa) exists in many varieties. It grows in the wild. It is also known as thorn apple. All parts of dhatura are poisonous but seeds and fruits are especially so. The active principles are hyoscyamine and hyoscine (Scopolamine). It also contains traces of atropine.

There are about 400 to 500 seeds in each fruit (Thorn Apple).

Fig. 11.2

Dhatura branch with flower and fruit

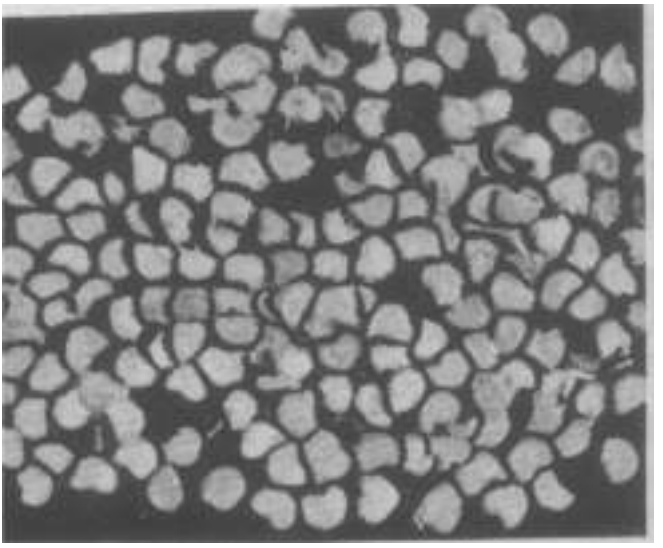

Fig. 11.3

Dhatura Seeds. One fruit contain 400-500 seeds.
The whole plant is poisonous especially the seeds.

11.8.6.2.1 Use/Abuse

Dhatura is used as a medicine, in Ayurveda system of medicine. It is misused as abortifacient. It is mixed in liquors to enhance the intoxication effect. The criminals often use it to stupefy their victims to:

- Rob them.
- Kidnap them (children).

11.8.6.2.2 Administration

Dhatura is administered in the following ways:

- Powdered seeds/ leaves are smoked after mixing them in tobacco.
- The powdered seeds are mixed in sweetmeats and given as PARSAD to the victims. Sometimes it is mixed with the food of the victims.
- Aqueous extracts of plants especially of the seeds, are mixed with liquor drinks and given to the victim.

A boy, in an unconscious state, was found at Kalyan railway station. He was taken to a hospital where he died. The viscera showed Dhatura poisoning A sadhu, from Hajimalang, had given him PRASAD a few hours earlier. The sadhu was located and searched. He still had some PRASAD. The examination showed dhatura in the PRASAD. (CH)

The complainant, with two other companions, was stationed at Durg railway station. An unknown person gave them PRASAD. They became unconscious. The complainant was relieved of his money. In the hospital, the victims recovered. Dhatura was detected in the stomach wash of all the 3 persons. The culprit could not be traced. (CH)

Accidental or suicidal dhatura poisoning cases are rare. It is usually used as a stupefying agent. Sometimes death occurs.

11.8.6.2.3 Symptoms

1. Bitter taste, difficulty in speech, excessive thirst, dryness of mouth and throat
2. Burning pain in the stomach
3. Dilated pupils, flushed face
4. High temperature — "hot as hare"(it inhibits sweating!)
5. Delirium, restlessness, confusion, hallucination, giddiness
6. Coma

11.8.6.2.4 Fatal Dose

- Dhatura is a non-fatal poison usually. However excessive dose: 100–125 seeds (60 mg of dhaturine) can prove fatal. Corresponding dose of dhaturine for children is about 4 mg; 60 mg of hyoscine (the active alkaloid).

11.8.6.2.5 Fatal Period

About 24 hours. Dhatura poisoning fatalities are rare.

11.8.6.2.6 Post-Mortem Findings

There is nothing characteristic. Seed may be found in viscera, gastrointestinal track may be congested and asphyxial signs are often present.

11.8.6.2.7 Solation

The meshed viscera slurry (minced tissues) or other biological materials are treated with 5% acid. Ammonium sulphate is used to precipitate the proteins. The material is heated over a boiling water bath for six hours. The filtrate is extracted with organic solvent in alkaline medium.

11.8.6.2.8 Detection

There are many tests for the poison, including the following:

- **Microscopic Test**. Microscopic examination of seeds or fragments of seeds picked up from stomach contents or vomitus shows characteristic features.
- **Physiological test**. One drop of the purified extracted residue (in 0.5% acetic acid) is installed in cat's eye which becomes dilated after a few hours.
- **Chemical test (Vitalis test).** A few drops of concentrated acid are added to dry residue in a porcelain basin and evaporated to dryness on a hot water bath. After cooling a drop of freshly prepared alcoholic caustic potash solution is added which gives violet colour.

- **Thin layer chromatography (TLC).** TLC gives different R_f values for different constituents of dhatura, such as atropine, and hyoscine.

11.8.6.2.9 Estimation

The extracted purified residue containing Dhatura alkaloids is dissolved in neutral ethyl alcohol. A known volume of 0.02 N sulphuric acid is added to it and kept on a water bath. After 30 min. the unreacted sulphuric acid is titrated against 0.02 N sodium hydroxide solution using methyl red indicator.

Each ml of 0.02 N sulphuric acid used = 5.786 mg atropine alkaloid.

11.8.6.2.10 Toxicological Materials

1. Vomitus
2. Purges and faeces
3. Stomach contents and wash
4. Blood and urine
5. Intestines.

11.8.6.3 Oleander

Fig. 11.4

Oleander is poisonous to humans and animals

11.8.6.3.1 Nature

Oleander is grown in gardens and on roadsides for the beauty of its flowers. It has two varieties, white oleander and yellow oleander.

All parts of the plants are highly poisonous. The active poisonous substances are, **'nerin'** in the case of white oleander and **"Cerberin"** and **"Thevetin"** in yellow oleander. They are

glycosides and behave like digitalis. The various parts of the plant are used as suicidal and homicidal poisons.

11.8.6.3.2 Use

Roots and leaves of the plants are used as medicine in cancer and ulcer treatment. They are also believed to be effective against venereal diseases. The bark in small doses is used as an antipyretic. The roots and leaves are used both internally and through vagina to cause abortion. It is also used as a cattle poison.

11.8.6.3.3 Administration

Oleander poisoning is often accidental when it is used as a medicine to secure abortion. Sometimes it is used as a suicidal poison. Homicidal administration is rather rare.

Oleander is administered in the form of pills. It is mixed with food materials, sweets, soft drinks and liquors. Or, it is administered in the form of decoctions of its roots and leaves.

11.8.6.3.4 Symptoms

1. Burning sensation in the mouth and throat,
2. Frothy salivation
3. Vomiting and diarrhoea with abdominal pain
4. Dizziness, jaw locking, fainting, and death

11.8.6.3.5 Post-Mortem Findings

Seeds or leaf fragments are often found even in putrefied bodies. The gastrointestinal track may be found congested.

11.8.6.3.6 Detection

1. It gives a pink colour on warming with sulphuric acid/phosphoric acid for some time, at 100° C.
2. Ether extract gives crimson colour with sulphuric acid and ferric sulphate.
3. Ether extract, when injected into a frog, produces convulsions in the frog

11.8.6.3.7 Toxicological Materials

1. Vomitus, purges, feces
2. Urine, blood
3. Stomach contents
4. Intestines

11.8.6.4 Madar (Aak, Akdo)

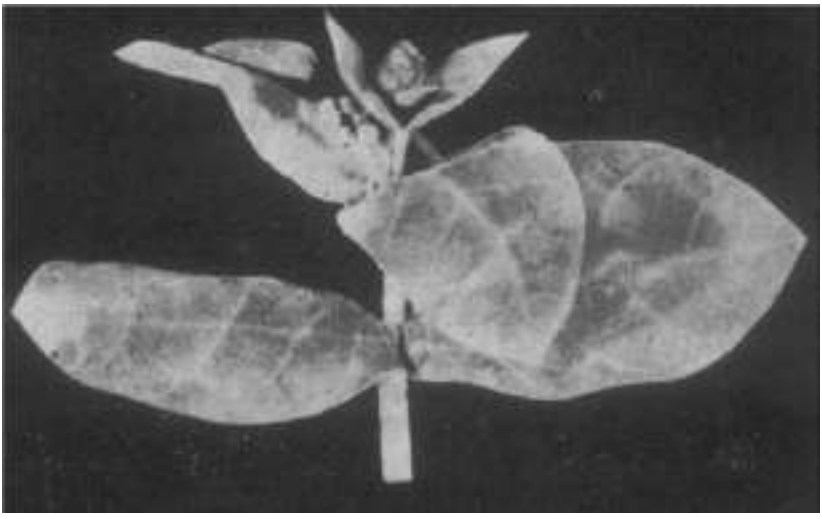

Fig. 11.5

A flowering branch of aak (the plant is used as medicine as well as poison)

11.8.6.4.1 Nature

Madar grows in the wild. All parts are poisonous. There are two varieties one has purple flowers and the other has white flowers. It contains a number of active principles which vary with terrain and climate. Some of the principles are highly poisonous.

11.8.6.4.2 Use

All the parts of the Madar are used in the Ayurvedic system of medicine. It is used to cause abortions and in the tanning of leather. Snake charmers sometimes keep the roots of the plant to control poisonous snakes, which do not like its smell.

They are also used to poison cattle. A rag smeared with madar juice is placed in the rectum of the animal.

Excessive doses of Madar preparations prove fatal. The various parts of the plant have been used for homicidal/suicidal purposes.

11.8.6.4.3 Administration

Madar leaves, flowers, juice and roots are used for criminal purposes. They are given orally/introduced into the body through vagina/rectum.

11.8.6.4.4 Symptoms

1. Bitter taste
2. Burning pain in the throat and stomach
3. Salivation
4. Restlessness

5. Breathing problems
6. Vomiting and diarrhoea
7. Dilated pupil
8. Convulsion, collapse and death

11.8.6.4.5 Post-Mortem Findings

1. Inflammation of food tract and stomach walls
2. Blood may be ooze out from the mouth and nostrils
3. Congestion in stomach, intestines, liver and brain

11.8.6.4.6 Detection

Madar extract is identified by:

1. Characteristic smell
2. Colour test
3. Biological test: injection of purified extract in a frog causes convulsions.

11.8.6.4.7 Toxicological Materials

1. Vomitus, purges, feces
2. Stomach contents
3. Intestines

11.8.7 Animal Poisons

Some species of snakes, scorpions, flies, and insects are poisonous. The most important from the fatal poisoning point of view is the snake. There are about 2500 species of snakes in the world, of which over 200 varieties are found in India. Some snakes are not poisonous or dangerously poisonous, only about 50 of them are dangerous. Some of them, e.g., cobra, krait and viper are very poisonous.

11.8.7.1 Snake Venom

Snake venom is a clear transparent liquid. It is toxic even in the dry state. Snake venom contains a number of poisonous materials, including **neurotoxins, haemotoxins, cardiotoxins,** which affect the body and its parts in different ways. They have usually the following toxic effects:

- **Neurotoxic effect.** The venom affects the nervous system. The person feels weak, giddy, and lethargic. The weakness slowly changes into paralysis.
- **Haemotoxic effect**. The blood does not clot. The wound continues to bleed. The toxin lysine, present in some venom, is responsible to lyse fibrinogen, the protein that promotes coagulation of blood and stops bleeding of wounds.

Snake venom is dangerous when injected into the blood stream. It is more or less harmless when taken orally. It is due to this reason that some people suck out the snake venom. If a person has injuries/ulcers in the mouth or in the food canal, he should not suck the venom. It may cause venom poisoning in him.

11.8.7.2 Administration

Snake venom is rarely used for criminal purposes though there are reported cases where animals were poisoned by snake venom. It was administered through the vagina or rectum. Alternatively, a snake may be made to bite an animal.

Deaths from accidental snakebite poisoning do occur in warm and moist climates.

11.8.7.3 Symptoms

The exact nature of the symptoms varies with the type of snake and the site of the bite but the general symptoms of the snake venom poisoning are:

1. Burning pain
2. Swelling and inflammation at the site of the bite
3. Giddiness, nausea and vomiting
4. Lethargy, muscular weakness, spreading paralysis
5. Bite from a krait may cause severe pain in the abdomen and convulsion before death
6. Difficulty in breathing, swallowing
7. Respiratory failure

11.8.7.4 Post-Mortem Findings

1. Bite marks on the body of the deceased.
2. Haemolysed purple blood
3. Local necrosis
4. Peeling of skin in some cases
5. Continuous blood oozing from the bite site, especially in viper bite

11.8.7.5 Detection

Local washings from the site of bite are also used to test snake poisoning. The extract is injected in frogs, with and without anti-venom serum. The frog without anti-serum should die and the other survives if there is snake poisoning.

11.8.7.6 Estimation

The fatal dose of the extract for a frog is determined. The total quantity is then calculated from the fatal dose.

11.8.7.7 Autopsy Materials

1. The skin around the bite
2. Blood
3. Kidney

11.8.8 Miscellaneous Poisons

11.8.8.1 Methyl Alcohol

11.8.8.1.1 Nature

Methyl alcohol (methanol) is a colourless liquid. Its boiling point is 64.7° C. It is miscible with water and alcohol in all proportions.

11.8.8.1.2 Use

Methyl alcohol is used as a solvent and in the manufacture of dyes and varnishes. It is also important constituent of denatured spirit (mentholated spirit). It is poisonous and causes blindness. It also proves fatal in many cases.[2] It comes to the public mostly as methylated spirit, which are 90 % alcohol and 10% methanol. In addition, contains pyridine and other chemicals to make it unfit/repulsive for drinking purposes.

11.8.8.1.3 Administration

Public consume methyl alcohol in the form of diluted methylated spirit, which is sold to the public by clandestine vendors as an alcoholic beverage.

11.8.8.1.4 Symptoms

1. Dizziness
2. Headache
3. Vertigo
4. Nausea and vomiting
5. Abdominal pain
6. Blurred vision, partial or complete blindness
7. Breathing difficulty, delirium
8. Convulsions, coma
9. Respiratory failure — death

11.8.8.1.5 Post-Mortem Findings

1. Mucous membrane of the stomach is inflamed
2. Lungs are swollen
3. Brain is congested

11.8.8.1.6 Fatal Dose

Fatal dose varies. Usual: 60-200 ml Yet 15 ml has caused blindness.

2. *Chandran v State of Kerala*, Appeal No. 1528 of 2005, decided on 4 April 2011 (Supreme Court), the tragic toll of the tragedy was: Dead, 31; blinded, 6; Seriously injured, 500].

11.8.8.1.7 Fatal Period

Fatal period is usually 24 to 36 hours. But in one case a person has died in one hour. In another case, death occurred after 4 days.

11.8.8.1.8 Isolation

It is isolated by steam distillation of the acidified minced tissues and other biological materials. The distillate contains methyl alcohol as well as ethyl alcohol, along with water.

11.8.8.1.9 Detection

11.28.1.9.1 Chromotropic acid test. — One drop of the distillate is mixed with one drop of 5% phosphoric acid and one drop of 5% $KMnO_4$ solution. After 5 minutes sodium bisulphite solution (5%) is added drop-wise, until the solution is clear. Then 5 ml of chromotropic acid solution (50 mg in 100 ml H_2SO_4) is added and heated in a water bath at 60° C for 30 minutes. A violet colour indicates the presence of methyl alcohol.

11.28.1.9.2 Schiffs reagent test.—To 5 ml of the distillate are added 2 ml of 3% $KMnO_4$ solution and 0.3 ml of concentrated phosphoric acid. After shaking, the contents are left for 10 minutes. Then 1 ml of 10% oxalic acid solution and 1 ml concentrated H_2SO_4 are added. After cooling, 5 ml of Schiff's reagent is added. The mixture is shaken thoroughly and kept for 30 minutes. A pink to purple colour is developed if methyl alcohol is present.

11.8.8.1.10 Estimation

Estimation is done by:

- Tests (1) and (2), described above under detection, through colorimetry.
- Spectrophotometry
- Gas chromatography

11.8.8.1.11 Toxicological Materials

1. Blood and urine
2. Vomitus
3. Stomach contents
4. Tissues

In an outbreak of poisoning due to illicit liquor in the districts of Kanpur and Nainital, many persons suffered from visual disturbances, lost their eyesight and died after consumption of the alleged liquor purchased from clandestine vendors. Ethyl alcohol and methyl alcohol were detected in the portions of viscera of some of the deceased persons, while the deaths of the other victims (from Nainital) were attributed to be due to consumption of tincture ginger prepared from denatured methylated spirit. (CH)

11.8.8.2 Abrus Precatorious (Indian Liquorice Gunchi, Rati)

The seeds are generally of red colour with a black spot at one end. Sometimes white seeds are also met with. The active principle of abrus precatorious seed is **'*abrin*'**, a thermolabile tox-albumin. The powdered seeds are usually employed for destroying cattle. Sometimes it is also used for homicidal purposes in the form of **'*suis*'** by pricking into the skin. Inflammation, oedema and necrosis surrounding the site of the puncture occur, followed by death within one to five days. The symptoms of abrus poisoning are very much like those of snake poisoning Abrin is deactivated by boiling. Gastric juices also reduce its poisonous properties. It is highly

poisonous if introduced in the blood stream. About 10 micrograms of Abrin, injected into the body, can kill a normal person.

Fig. 11.6

A flowering branch of aak (the plant is used as medicine as well as poison)

The sodium chloride solution of the fragments of the '*Sui*' or of the seeds, when injected into a fowl produces inflammation and necrosis at the site of injection, followed by the death of the bird within one to three days.

11.8.8.3 Aconite

Among Indian species, "*Aconitum Chasmanthum*" is the chief source of aconite. It is largely used in medicine. The root and all the parts of this plant are poisonous, the main toxic principle being **aconitine**. Cases of suicidal and homicidal poisoning by aconite do occur in India. The extract of aconite, when applied to the tongue, produces tingling and numbness sensations on the tongue and lips, lasting for several hours.

This is the characteristic and confirmatory physiological test of this poison.

The fatal dose is about 2 g of aconite root. 5 mg of the active principle aconite can prove fatal.

The fatal period is less than 20 hours.

11.8.8.4 Barium Carbonate

This is a fine white powder, largely used as rat poison. Free hydrochloric acid of the stomach converts it into soluble barium chloride—a highly poisonous substance.

11.8.8.5 Cannabis

The products of the cannabis plant are commonly known as *bhang*, *ganja* and *charas,* in India. In other countries the cannabis products are known by a host of other names.

Cannabis has a characteristic odour, which is more prominent when the substance is burnt.

The main active principles of the plant are cannabinol, cannabidiol, tetrahydrocannabinol (THC) and cannabidiolic acid. Tetrahydrocannabinol (THC) is mainly responsible for its physiological activities.

Fatal poisoning of human beings by cannabis products is rare. Continued excessive abuse can chronic poisoning The patient lives in a state of stupor and suffers from melancholia and hallucinations.

Cannabis or its products do not create poisoning problems in India.

11.8.8.6 Carbon Monoxide

Carbon monoxide is a highly poisonous gas. Carbon monoxide poisoning generally occurs when the victim sleeps in a closed room in which a coal '*angithi*' is burning

Carbon monoxide is absorbed in the blood through the lungs and forms carboxyhaemoglobin. The oxygen carrying capacity of the blood is reduced. It results in death when carbon monoxide blood saturation is over 40%. Air is safe only if carbon monoxide is less than 0.01%. If it exceeds 0.25% the exposed persons die in about 4 to 5 hours. 1% carbon monoxide in the air can kill a person in minutes (~15 minutes).

The detection and determination of carbon monoxide in the blood is done by Hartridge's Reversion Spectroscope.

11.8.8.7 Caustic Alkali

Caustic soda, caustic potash and other hydrates and carbonates act as corrosive poisons when consumed in the concentrated form. However, in the dilute form they act as irritant poisons.

The main symptoms are acrid and soapy taste, sense of heat and burning pain in the throat and stomach. Death may occur from suffocation due to inflammation of the glottis or from broncho-pneumonia.

11.8.8.8 Chloral Hydrate

This is a colourless, crystalline substance having a characteristic pungent smell. It is readily soluble in water and alcohol. In certain areas, it is known as '*Sukka Sharab*' (dry liquor). It is added to alcoholic drinks by clandestine vendors to increase the potency of the drink.

Chloral hydrate is also used as a hypnotic in medicine.

11.8.8.9 Cyanogenetic Glycoside

Certain naturally occurring vegetable substances such as bitter almond, linseed oil seeds, leaves of cherry laurel, kernels of common cherry, plum, peach, certain stone fruits, Juwar plant and other millets contain poisonous substances known as cyanogenetic glycosides. In the presence of water and a natural enzyme called emulsin, these cyanogenetic glycosides are readily hydrolysed and free hydrocyanic acid is liberated, which is a deadly poison.

The presence of cyanogenetic glycoside is tested by copper benzidine, guiacum or picric acid test papers.

Fig. 11.7

Poisonous plants killed many animals in district Mandi, HP, some years ago (Juwar plant)

11.8.8.10 Ergot

It is a parasitic fungus, attacking the grains of several plants such as rye, oats, wheat, barley and bajra in wet seasons. It is used in some medicinal preparations. It was largely used as an abortifacient. Its improper use by quacks results in deaths.

11.8.8.11 Kuchila (Strychnos nux vomica)

The seeds of Kuchila (*Strychnos nux vomica*) are grey coloured flat circular discs slightly concave on one side having a shining surface with short silky hair. These seeds contain two main alkaloids, **strychnine** and **brucine**. Both are poisonous but strychnine is about 10 times more poisonous than brucine.

The symptoms are stiffening of the body; starting sporadically and then continuously.

11.8.8.12 Lead Salts

Lead acetate, carbonate, chromate, nitrate and other salts of lead are poisonous. Lead poisoning known as plumbism occurs mainly among people working in industries and factories dealing with lead and its salts. The poisoning occurs due to inhalation of lead dust and fumes. It also results from tinned foodstuff, which gets contaminated with lead. Red lead, used as an abortifacient by quacks, may also produce poisoning Sometimes, lead particles due to gunshot injuries, which remain embedded in the body, may also produce poisonous symptoms after weeks or after long intervals.

In plumbism, the victim excretes lead through urine and faeces.

11.8.8.13 Mercury Salts

Metallic mercury is not considered to be poisonous but under certain conditions it undergoes some chemical changes in the body and acts as a poison. The vapours of mercury are poisonous. Soluble salts of mercury such as nitrate, sulphate and mercuric chloride (also known as corrosive sublimates) are highly poisonous. The symptoms of poisoning appear within half an hour. The main symptoms are, choking sensation in the throat, hoarse voice, difficulty in breathing and burning sensation in the abdomen.

Death takes place within a few hours after ingestion of the poison.

11.8.8.14 Mushrooms

These are forms of fungi. Edible mushrooms are used as vegetables but some varieties are poisonous. Several cases of mushroom poisoning have been reported in the literature. Some persons may show toxic symptoms by after eating even edible mushrooms due to body idiosyncrasy!

11.8.8.15 Mechanical Poisons

Diamond or diamond powder is a well-known mechanical poison. Powdered glass, needles and animal or vegetable hairs also act as mechanical irritants and poisons. When these are swallowed, they cause irritation of the stomach and bowels due to their sharp edges and points and sometimes rupture the intestine and cause death.

11.8.8.16 Nicotine

Tobacco is used throughout the world for smoking, in cigarettes, cigars, pipes, It is also chewed either alone or mixed with lime.

Tobacco contains an alkaloid 'Nicotine', which is one of the deadliest poisons. Only three to four drops of the pure nicotine, if taken internally, may prove fatal. Tobacco dry leaves contain from 0.6 to 6% nicotine. Persons consuming an excess of tobacco for a long period may suffer from chronic poisoning.

11.8.8.17 Oxalic Acid

It is a colourless crystalline substance, resembling sugar in appearance. It is soluble in water and alcohol. The concentrated solution of oxalic acid acts as a corrosive poison.

The symptoms appear immediately. They are: sour acidic taste, thirst, burning pain in the mouth, throat and stomach, feeling of numbness of the limbs, quick respiration, and coma. Death follows.

11.8.8.18 Quinine

Quinine is a well-known anti-malarial drug. Sometimes accidental poisoning occurs due to overdose or owing to the individual's idiosyncrasy. At times, the medicinal dose of quinine also produces poisoning in some persons.

Quinine is also used as an abortifacient, which sometimes proves fatal.

11.8.8.19 Sodium Nitrite

It is a white crystalline substance readily soluble in water. It is largely used in the dyeing industry. On account of its easy availability, the cases of nitrite poisoning are more frequent in areas near the dyeing industries.

The main symptoms are giddiness, headache, vomiting, purging, weakness, hurried breathing and unconsciousness, followed by death.

11.8.8.20 Mineral Acids

Sulphuric acid and nitric acid are used extensively in industry. In concentrated form, the acids are highly corrosive. They destroy the tissues when they act on them.

The internal administration of the concentrated acids produces intense burning pain from mouth to stomach; intense thirst and difficulty in swallowing Lips and mouth are corroded. Nitric acid action turns the skin yellow. Death may occur due to shock within a few hours.

Internal administration of acids, for murder, is not common but acid throwing cases often occur and they are on the increase. They produce severe burns and may cause even death (due to shock). However, there are a few reported cases of suicide by strong mineral acid ingestion.

11.8.8.21 Zinc Phosphide

It is a fine black powder commonly used as rat poison. Recently, human poisoning by zinc phosphide has increased considerably.

The main symptoms are frequent vomiting/purging, followed by unconsciousness. Being a fine powder it adheres in the crypts and cavities of the stomach and is not completely eliminated through vomiting. Death may ensue from the liberation of phosphine from the adhered material.

11.9 PRESENTATION

A chemical examiner's report is covered under section 293 of the Code of Criminal Procedure, 1973. That is, the report is accepted as evidence without the appearance/oral evidence of the chemical examiner. However, if the judges feel that personal attendance of the expert is essential, he can summon the chemical examiner, to elicit/ elucidate/elaborate or provide additional information on the topic.

In view of the fact that the reports are accepted as evidence, it is necessary that the reports are comprehensive, containing the information:

1. The mode of receipt of the articles for examination.
2. The date of receipt of the articles.
3. The description of packages: sealed/unsealed, seals intact, seals tallying with the specimen seals, number of seals, writings, signatures, thumb impression on the parcels.
4. The complete description of the articles.
5. The identification marks, the laboratory serial number, put by the examiner on the articles. All the packages and articles should carry the number, properly secured to the article or package.
6. The names of the tests carried out by the examiner with brief details.
7. The brief description of the observations made from these tests.
8. The brief description of the inferences drawn from these observations with reason.
9. The qualitative and quantitative results arrived at after these observations.
10. The date(s) of examination of the exhibits.
11. The photographs, sketches and diagrams, if any, are attached with the report with explanatory notes.
12. The negative evidence is explained.
13. The report is precise, concise, intelligible and in nontechnical language.

The courts are wary of accepting incomplete/bare reports as evidence.

11.10 JUDICIAL PROOF

In suspected homicidal poisoning cases, the judicial proof demands proof of the following entities beyond reasonable doubt:

1. The victim died of poisoning.
2. The accused had the motive for killing or injuring the victim.
3. The accused had the poison in his possession.
4. The accused had the opportunity to administer the poison.
5. The accused did administer the poison.

11.10.1 Poisoning

The following evidence proves the proposition that the victim died of poisoning:

1. The poison was found in the body, vomitus or purges of the person. It is the best proof of poisoning But it is not always available:
   - The body is missing, excessively putrefied, destroyed by cremation, eaten by the beasts,
   - Poison is metabolized to non-identifiable metabolites.
   - The poison is eliminated by vomiting, purges, stomach wash, antidotes.
2. The victim exhibited the symptoms of poisoning.
3. The body of the victim carries symptoms of poisoning.
4. There were witnesses who saw the victim administering/consuming the poison.
5. There was no evidence of disease in the victim before/after the death.[33]

11.10.2 Possession of the poison

The following evidence proves the possession of the poison with the suspect:

1. The poison was recovered from the suspect.
2. The suspect purchased the poison.
3. The poison was part of the household effects.
4. The hobby of the suspect involved access to the poison.
5. The suspect dealt with the poison officially.
6. The suspect had knowledge about the herbal poisons.
7. The accused had access to the poison.

11.10.3 Opportunity

The following evidence indicates the opportunity:

1. They were members of the household (family).
2. They were friends or acquaintances.
3. They were seen together.
4. Witnesses saw the administration.

11.10.4 Motive

The motive for poisoning is proved (found) from the background of the victim and the accused from the acts of omission and commission and the circumstantial evidence. For example, in the above case, the Supreme Court found that the accused had drawn money from the account of the victim by forgeries.

11.10.5 Absence of disease/other Causes

The medico-legal expert examines this angle as a part of post-mortem examination and certifies the cause of death. In the above referred case, the factum was taken into consideration and mentioned in their judgment.

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3. *Anant Chintaman Lagu v State of Bombay,* AIR 1960 SC 500 : (1960) : 2 SCR 460 : 1960 Cr LJ 682 (SC).

ANNEXURE 1

POISONS OF ANIMAL ORIGIN

S. No.	Poison	Administration	Fatal Dose	Fatal Period	Symptoms	Evidentiary Clues	Active Principles	Action
1.	Venom Cobra Viper Sea snake	Bite " " "	 15 mg (dry) 40 mg (dry) 10 mg (dry)	Minute To hours/ Days	1. Burning at site. 2. Giddiness, 3. Weakness to paralysis 4. Salivation. 5. Speaking difficult 6. Breath slow 7. Ceasing of respiration 8. Bite marks 1 to 2 cm. deep 9. Local pain severe, swelling 10. Bleeding from bite site, gums, rectum, nose, etc.	1. Skin & tissue from bite site. 2. Haemolysed blood. 3. Washings from the site	1. Cholinstrase 2. Thromboplastin 3. Proteolysins 4. Aaemolysins 5. Neurotoxin 6. Cardiotoxin 7. Fibrinotoxin	1. Neurotoxic 2. Cardiotoxic 3. Vasculotoxic 4. Myotoxic
2.	Scorpion Venom	Sting	———	———	1. Severe pain 2. Burning pain 3. Headache,giddiness 4. Perspiration. 5. Cramps 6. Sometimes unconscious	1. Skin/ tissues around sting 2. Haemolysed blood 3. Washings from the sting	Toxalbumins	Neurotoxic Haemotoxic

ANNEXURE II

POISONS OF VEGETABLE ORIGIN

S. No.	Poison	Administration	Fatal Dose	Fatal Period	Symptoms	Evidentiary Clues	Active Principles	Action
1.	Abrus Precato-rious	1. Extract injected. Placed in the wound. 2. Powder formed into a 'sui' and inserted in the body	Extract from 1-2 seeds (90 - 120 mg) powder.	3-5 days	Site: Odema, inflammation. Loss of appetite. Severe pain. Death.	1. Residue of powdered seeds in the wound. 2. Clothes of the victim. 3. Body site attacked. 4. Paraphernalia used.	Abrin: 1 to 2 microgram fatal	Toxalbumin
2.	Aconite (*Mitha Zahar*)	1. Betel Leaf 2. Sweetmeats 3. Arrow poison	1 gm. Roots 250 mg extract 4 mg of alkaloid	1-24 hours	Tingling, numbness of the body parts in contact (lip, mouth,) salivation giddiness, convulsion. Respiratory paralysis.	Vomitus, stomach wash, viscera	Aconitine	1. Ventricular fibrilation 2. Respiration paralysis
3.	*Dhatura* (Road Poison)	1. Food (powder seeds in). 2. Tobacco/bidi. 3. Candy sweets	100-125 (1gm.) Seed powder, alkaloid 60 mg	24 hours	Bitter taste, dry mouth, flushed face, dilated pupils, vomiting, giddiness, confusion delirium, hallucination, stupor – coma–death.	Stomach contents (*Dhatura* Seeds), vomitus, purges	1. Hyoscyamine 2. Hyocine or (Scopvlamine) 3. Atropine	Hyocine used as truth serum.
4.	Madar Akdo, Calotropis	1. Snuff 2. Mixed food/ drink 3. Body orifices 4. Poison arrow	Variable uncertain	one-second to 8 hours, < 12 hours	Burning sensation on skin in contact, nausea, vomiting, diarrhea, dilated pupil. convulsion, delirium, collapse, death.	1. Wash from the site. 2. Viscera. 3. Affected tissue.	1. Calotoxin 2. Calotropin 3. Uscharin	1. Gastro-intestinal poison 2. Cerebrospinal poison

S. No.	Poison	Administration	Fatal Dose	Fatal Period	Symptoms	Evidentiary Clues	Active Principles	Action
5.	Capsicum (Chillies)	Introduced in body orifices	Usually non-fatal	———	1. Skin irritation, inflammation. 2. Intense Lachrimation	1. Washings 2. Viscera. 3. Affected tissue.	Capsicin	Local irritant
6.	Colocynth (bitterapple)	Oral	1–2 gm.	~24 hours	Severe abdominal pain	1. Washing 2. Viscera 3. Bloodstain 4. Vomiting	Colocynthin, resinous glycocide.	Irritant Affect kidney. Collapse, Death
7.	Croton tiglium (*Jamalgota*)	Oral Inhalation	4 seeds ~ 20 drops of oil.	~6 hours	Blisters, severe gastrointestinal and abdomen pain, and powerful purging	Washings, Viscera	Crotin	Toxalbumin Irritant
8.	Digitalis (Digitalis purpurea Floxglove)	Oral	1.5 mg digitoxin, 30 mg digitalin	~24 hours	Irritation of stomach nausea, vomiting, giddiness heart block, drowsiness, coma, death.	Viscera	1. Digitoxin 2. Digitalin 3. Digitalein 4. Digitonin	1. Affect heart muscles. 2. Cummulative action.
9.	Ergot	Oral	1 gm.	Variable > 24 hours, to 7 days	Irritation in throat, nausea, vomiting, diarrhea, pain in abdomen, cramps.	Viscera	1. Fungus growth on cereals especially rye. 2. Ergotoxin. 3. Ergoplamine 4. Ergometrine.	Contraction of muscles Hypoglycemia

S. No.	Poison	Administration	Fatal Dose	Fatal Period	Symptoms	Evidentiary Clues	Active Principles	Action
10.	Hyseyamus	Oral	15 – 30 mg of hyoscine or 125 mg of hyoscyamine	< 24 hours	Bitter taste, stomach pain, dry mouth, flushed face, dilated pupils, vomiting giddiness, dilirium stupor, coma, death	Stomach wash or Viscera	1. Atropine 2. Hyoscine 3. Hyoscyamine	Affects brain used as truth serum.
11.	Marking Nut	1. Skin 2. Oral 3. Orifices	10 mg	< 24 hours	Blisteron skin, severe gastrointestinal irritation, coma, death.	Blister fluid in rectified spirit.	1. Semecarpol 2. Bhilawanol.	Irritant (also used as abortifacient)
12.	Nicotine	1. Ingestion 2. Inhalation	50 mg	Uncertain minutes to hours	Burning, pain, bitter taste, nausea, weakness, coma.	Viscera, blood, urine	Nicotine	Paralysis of mid-brain, spinalcord
13.	Kuchila Nux Vomica (Strychnos)	Oral, wounds, skin	2 g powder/ 15-20 mg alkaloid	1-2 hours	Bitter, body stiffens, convulsions, blood stained froth	Viscera, spinal cord	1. Strychnine 2. Brucine 3. Loganin	Excessive stimulation of spinalchord
14.	Kaner, White Oleander	Oral/local	15 g roots (extract)	< 24 hours	Vomitting, pain in abdomen, Salivation, Breathing trouble, muscular twitching, Spasm, exhaution, death	Viscera	Nerin: 1. Neriodorin 2. Neriodorein 3. Karabin (all Glycosides)	Cardiac arrest, spinal cord spasm.
15.	Yellow Oleander	Oral	8-10 seeds	< 24 hours	Burning feeing, vomitting, motions, headache spasm coma, death	Viscera	Thevitin, Thevotoxin Cerebrin (glycosides)	Cardiac arrest, spasm

11.11 ADDITIONAL READING

E. Hodgson. *Modern Toxicology.* Wiley – Interscience.

11.12 CASE LAW

11.12.1 Circumstantial Evidence for poisoning:[4]

Author's Summary

Landmark Judgment: It is a diabolical murder by the family doctor of the victim for money. The victim was diabetic moneyed patient under his treatment. He gave her an overdose of insulin while travelling with her on a train to Mumbai. It put her in coma. He on reaching Mumbai got her admitted in the hospital and vanished from the scene. The lady did not recover from the coma and died.

Postmortem of the deceased did not reveal the cause of death. However, the medico legal experts found that she did not suffer any fatal ailment.

The circumstantial evidence against the family doctor was substantial. He was convicted for murder by the trial court. The High Court and the Supreme Court maintained the conviction in spite of the fact that basic element of poisoning death were not proved.

Highlights italicised

Relevant Extracts Verbatim

Our findings thus substantially accord on all the relevant facts with those of the two courts below, though the arrangement and consideration of the relevant evidence on record is somewhat different. It is now necessary to consider the arguments which have been advanced on behalf of the appellant. The first contention is that the essential ingredients required to be proved in all cases of murder by poisoning were not proved by the prosecution in this case. Reference in this connection is made to a decision of the Allahabad High Court in *Mt. Gajrani v Emperor*,[5] and to two unreported decisions of this court in *Chandrakant Nyalchand Seth v State of Bombay*,[6] decided on February 19, 1958. In these cases, the court referred to three propositions, which the prosecution must establish in a case of poisoning:

(a) that death took place by poisoning;

(b) that the accused had the poison in his possession; and

(c) that the accused had an opportunity to administer the poison to the deceased.

The case in Cr. A. No. 98 of 1958, D/-4-11-1958 (SC) turned upon these three propositions. There, the deceased had died as a result of poisoning by potassium cyanide, which poison was also found in the autopsy. The High Court had disbelieved the evidence which sought to establish that the accused had obtained potassium cyanide, but held, nevertheless, that the circumstantial evidence was sufficient to convict the accused in that case. The court did not, however, accept the circumstantial evidence as complete.

It is to be observed that the three propositions were laid down not as the invariable criteria of proof by direct evidence in a case of murder by poisoning, because

- *evidently if after poisoning the victim the accused destroyed all traces of the body, the first proposition would be incapable of being proved except by circumstantial evidence.*

4. *Anant Chintaman Lagu v The State of Bombay,* AIR 1960 SC 500 : (1960) 2 SCR 460 : 1960 Cr LJ 682 (SC).
5. AIR 1933 All 394 : 34 Cr LJ 754.
6. Cr. A No. 120 of 1957.

- *Similarly, if the accused gave a victim something to eat and the victim died immediately on the ingestion of that food with symptoms of poisoning and poison, in fact, was found in the viscera, the requirement of proving that the accused was possessed of the poison would follow from the circumstance that the accused gave the victim something to eat and need not be separately proved,*

There have been cases in which conviction was maintained, even though the body of the victim had completely disappeared, and it was impossible to say, except on circumstantial evidence, whether that person was the victim of foul play, including poisoning Recently, this court in *Mohan v State of Uttar Pradesh*,[7] decided on November 5, 1959, held that the proof of the fact of possession of the poison was rendered unnecessary, because the victim died soon after eating *pedas* given by the accused in that case, and he had not partaken any other food likely to contain poison.

In *Dr. Palmer's* case, Notable Trials Series, strychnine was not detected, and the accused was convicted by the jury after Lord Chief Justice Campbell (Cresswell, J. and Mr. Baron Alderson concurring) charged the jury that the discovery of the poison on autopsy, was not obligatory, if they were satisfied on the evidence of symptoms that death had been caused by the administration of strychnine. The conduct of Palmer, which was also significant, was stressed inasmuch as he had attempted to thwart a successful chemical analysis of the viscera, and had done suspicious acts to achieve that end.

In *Dr. Crippen's* case,[8] the conduct of the accused after the death of Mrs. Crippen in making the friends and relatives believe that Mrs. Crippen was alive, was considered an incriminatory circumstance pointing to his guilt. No doubt, in *Dr. Crippen's* case, the body was found and poison was detected, but there was no proof that *Dr. Crippen* had administered the poison to her, that being inferred from his subsequent conduct in running away with Miss Le Neve. In the second case of this court, the poison was available to the victim, and it was possible that she had taken it to end an unhappy life.

The cases of this court which were decided, proceeded upon their own facts, kept in mind always, the sufficiency of the evidence, direct or circumstantial. To establish murder by poisoning will depend on the facts of each case. If the evidence in a particular case does not justify the inference that death is the result of poisoning because of the failure of the prosecution to prove the fact satisfactorily, either directly or by circumstantial evidence, then the benefit of the doubt will have to be given to the accused person. But if circumstantial evidence, in the absence of direct-proof of the three elements, is so decisive that the court can unhesitatingly hold that the death was a result of administration of poison (though not detected) and that the poison must have been administered by the accused person, then the conviction can be rested on it.

* * * * *

In (1952) NZLR 111, where the entire case law in England was presented for the consideration of the court, it was pointed out by the court that

- there was no rule in England that *corpus delicti* must be proved by direct evidence establishing the death of the person and
- further, the cause of that death. Reference was made to *Evans v Evans*,[9] where it was ruled that *corpus delicti* might be proved by direct evidence or by "irresistible grounds of presumption". In the same case, it has been pointed out that in New Zealand the court upheld numerous convictions, where the body of the victim was never found.

7. *Mohan v State of Uttar Pradesh*, AIR 1960 SC 659 : 1960 Cr LJ 1011.
8. Notable Trial Series.
9. 161 ER 466 (491).

The rule of law stated by Sir Matthew Hale in *Pleas of the Crown* Vol. 2, p. 290, that

> I would never convict any person of murder or manslaughter, unless the fact was proved to be done, or at least the body found dead" was not accepted in this and other cases.

Lord Goddard also rejected the statement as one of universal application, in the case to which we have already referred.

- The case of *Mary Ann Nosh*,[10] is illustrative of the proposition that even though the cause of death may not appear to be established by direct evidence the circumstances of the case may be sufficient to infer that a murder has been committed. In that case, the prisoner had an illegitimate son, 5 years old. There was evidence to show that the mother desired to put the child out of her way. One day in June, 1907, the mother left the house and returned without the child. She made several statements as to what had happened to the child, which were found to be untrue. As late as April 1908, the body of a child was discovered in a well. Decomposition had so far advanced that even the sex of the child could not be determined. There was nothing therefore to show whether the death was natural or violent, or whether it had occurred before or after the body was put into the well. The case was left to the jury. On appeal, it was contended that there being no proof how death took place, the judge should not have left the case to the jury but ought to have withdrawn it. Lord Chief Justice delivering the judgment of the Court of Appeal referred to the untrue statements of the prisoner about the whereabouts of the child, and observed as follows:

> *All these statements were untrue. She had an object in getting rid of the child, and if it had been lost or met with an accidental death, she had every interest in saying so at once. It is said there is no evidence of violent death, but we cannot accept that Mr. Goddard cannot have meant that there must be proof from the body itself of a violent death....In view of the facts that the child left home well and was afterwards found dead, that the appellant was last seen with it, and made untrue statements about it, this is not a case which could have been withdrawn from the jury.*

* * * * *

A case of murder by administration of poison is almost always one of secrecy. The poisoner seldom takes another into his confidence, and his preparations for the commission of the offence are also secret. He watches his opportunity and administers the poison in a manner calculated to avoid its detection. The greater his knowledge of poisons, the greater the secrecy, and consequently the greater the difficulty of proving the case against him. What assistance a man of science can give he gives; but it is too much to say that the guilt of the accused must, in all cases, be demonstrated by the isolation of the poison, though in a case where there is nothing else such a course would be incumbent upon the prosecution. There are various factors which militate against a successful isolation of the poison and its recognition. The discovery of the poison can only take place either through a post-mortem examination of the internal organs or by chemical analysis. Often enough, the diagnosis of a poison is aided by the information which may be furnished by relatives and friends as to the symptoms found on the victim, if the course of poison has taken long and others had an opportunity of watching its effect.

Where, however, the poison is administered in secrecy and the victim is rendered unconscious effectively, there is nothing to show how the deterioration in the condition of the victim took place and if no poison but disease is suspected, the diagnosis of poisoning may be rendered difficult. In *Champman's* case. Notable Trials Series, the victim (Maudmarsh) was

10. 1911 Cr App rule 225.

sent to Guys Hospital, where the doctors diagnosed her condition to be due to the various maladies "including cancer, rheumatism and acute dyspepsia". It is clear that doctors can be deceived by the symptoms of poison into believing that they have a genuine case of sickness on hand. In *Dr. Palmer's* case, Notable Trials Series, two medical witnesses for the defence diagnosed the case from the symptoms as being due to Angina Pectoris or epilepsy with the tetanic complications.

The reason for all this is obvious. Lambert in his book, "*The Medico-Legal Post-mortem in India*" (pp. 96, 99-100) has stated that the pathologist's part in the diagnosis of poisoning is secondary and has further observed that several poisons particularly of the synthetic hypnotics and vegetable alkaloids groups do not leave any characteristic signs which can be noticed on post-mortem examination, (see Modi's "*Medical Jurisprudence and Toxicology*", 13th Edition, pages 450-451 and Taylor's "*Principles and Practice of Medical Jurisprudence*", Volume II, page 229). The same is stated by Otto Saphir in his book "*Autopsy*" at pp. 71 and 72. In Dreisbach's "*Handbook of Poisons*" 1955, it is stated that pathological findings in deaths from narcotic analgesics are not characteristic. He goes further and says that even the laboratory findings are non-contributory. The position of the pathologist who conducts a post-mortem examination has been summed up by Modi in "*Medical Jurisprudence and Toxicology*", 13th Edn., p. 447 as follows:

> *In order to make a probable guess of the poison and to look for its characteristic post-mortem appearances, it is advisable that a medical officer, before commencing a post-mortem examination on the body of a suspected case of poisoning, should read the police report and endeavour to get as much information as possible from the relatives of the deceased regarding the quality and quantity of the poison administered, the character of the symptoms with reference to their onset and the poison and the development of the first symptoms, the duration of the illness, nature of the treatment adopted, and the time of death. He will find that in most cases the account supplied by the police and the relatives is very meagre, or incorrect and misleading His task is, therefore, very difficult, especially when many of the poisons except corrosives and irritants do not show any characteristic post-mortem signs and when bodies are in an advanced state of decomposition.....*

Similarly, Gonzales' *Legal Medicine and Toxicology*' states at p. 629:

> *The question of whether or not a negative toxicological examination is consistent with death by poison can be answered affirmatively, as many persons overcome by carbon monoxide die after twenty-four hours, at which time the gas cannot be determined in the blood by chemical tests. Likewise, the organs of individuals who have been poisoned by phosphorus may not contain the toxic substance responsible for the death if they have managed to survive its effects for several days.*

Many conditions seriously interfere with the toxicological examination, such as post-mortem decomposition.....

We need not multiply authorities, because every book on toxicology begins with a statement of such a fact. Of course, there is a chemical test for almost every poison, but it is impossible to expect a search for every poison. Even in chemical analysis, the chemical analyser may be unsuccessful for various reasons. Taylor in his "*Principles and Practice of Medical Jurisprudence*" (Vol. II, p. 228), gives three possible explanations for negative findings, *viz.*,

(1) the case may have been of disease only;

(2) the poison may have been eliminated by vomiting or other means or neutralised or metabolised; and

(3) the analysis may have been faultily performed.

Svensson and Wendel in "*Crime Detection*" have stated at p. 281 that:

> *Hypnotics are decomposed and disappear very quickly some even in the time which elapses between the administration and the occurrence of death.*

Circumstantial evidence in this context means a combination of facts creating a network through which there is no escape for the accused, because the facts taken as a whole do not admit of any inference but of his guilt. To rely upon the findings of the medical man who conducted the post-mortem and of the chemical analyser as decisive of the matter is to render the other evidence entirely fruitless. While the circumstances often speak with unerring certainty the autopsy and the chemical analysis taken by themselves may be most misleading No doubt, due weight must be given to the negative findings at such examinations. But, bearing in mind the difficult task which the man of medicine performs and the limitations under which he works, his failure should not be taken as the end of the case, for on good and probative circumstances, an irresistible inference of guilt can be drawn.

In the present case, the effort of the appellant has been to persuade the court that the death of Laxmibai was possibly the result of disease rather than by poison. During the course of the case and the appeal, various theories have been advanced and conflicting diagnoses have been mooted. The case of the appellant has wavered between death by diabetic coma and by hypoglycemia, though relying upon the condition of the arteries and the aorta and the rigidity of the neck, suggestions of coronary complications and renal failure have also been made. We have shown above that this was not a case of diabetic coma because of the absence of the cardinal symptoms of diabetic coma. This also is the opinion of Dr. Variava and Dr. Mehta, though Dr. Jhala, for reasons which we have indicated, accepted it. The appellant argued again the case from the angle of diabetic coma, but later veered in favour of hypoglycemia. This change is noticeable not only in the arguments before us but also throughout the conduct of the case is merely to confuse the issue, and create, if possible a doubt, which would take the mind away from the surrounding circumstances and focus it only upon the medical aspect of the case. Full advantage has been taken of the findings of Dr. Ugale and Dr. Miss Aneeja, which suggest partly an onset of diabetic coma, partly of hypoglycemia and partly of renal failure. There is no true picture of any one disease. The rigidity of the neck was not reflected in the chemical analysis of the cerebro-spinal fluid and was negatived, insofar as renal failure is concerned, by the negative findings about albumen. Diabetic coma stood ruled out by the presence of the Babinsky sign and the suddenness of the onset, the negative aspect of acetone and the rather remarkable failure of the specific treatment given for it to have worked any change. Driven from these considerations to such doubtful suggestions as coronary complications of which no physical evidence was found by Dr. Jhala, the appellant put his case on hypoglycemia, and relied upon the fact that at the hospital 40 units of insulin intravenously and another 40 units subcutaneously were administered. Medical textbooks were quoted to show that in the case of the hypoglycemic coma the introduction of even a small quantity of insulin sometimes proves fatal. The learned advocate general stoutly resisted this move, which was at variance with the case as set out before the High Court, because it is obvious enough that if one accepted the theory of hypoglycemic coma, the only injections of insulin causing such shock would be proved to have been given at the hospital and not by the appellant. Here, the position, however, is not so difficult for the state, because Laxmibai was found to have 4 oz. of pasty meal in her stomach, and with food inside her, the possibility of hypoglycemia taking place naturally was extremely remote. If it was hypoglycemic coma due to excessive administration of insulin, then it must have been administered prior to its onset, and who could have given it but the appellant? Even though coma supervenes suddenly, the patient passes through symptoms of discomfort, and Laxmibai would have told the appellant about it in the train. The appellant mentioned nothing of this to Dr. Ugale. If an excessive dose of insulin was given by the appellant, the question of intent would arise, and the conduct shows the intention. There were no pronounced symptoms of hypoglycemia either. Laxmibai just passed from unconsciousness to death without the

manifestation of any of the signs associated with the syndrome of hypoglycemic death. It is also to be remembered that hypoglycemic coma is generally overcome by the administration of a very small quantity of glucose 5 or 10 grams of glucose orally: *Treatment of Diabetes Mellitus* by Joslin, Root and White, p. 350. The 40 units given intravenously were mixed with 20 c.c. of glucose and carried the palliative with them. Even otherwise, Laxmibai was receiving glucose by intragastric drip, and during the three and a half hours there should have been an improvement. The surprising part is that the administration of the insulin and glucose brought about no visible symptoms in the patient either for better or for worse. She passed into death, and the inference can only be that she did not die of these diseases of which she was either suspected or for which she was treated but of something else, which could not answer to the treatment given to her.

Dreisbach in his *Handbook on Poisons* at page 27 has stated that coma also results from the action of several poisons. Depressants, sedatives and hypnotics all cause death by coma (*ibid.* p. 201). The symptoms, according to the author, are sleepiness, mental confusion, unsteadiness rapidly followed by coma with slow, shallow respiration, flaccid muscles and absent deep reflexes. The difference between coma due to disease and coma as the result of poisons is stated by him in the following words:

> *Coma from poisoning presumably results from some interference with brain cell metabolism. In attempting to combat the effects of drugs which induce coma, remember that no agents are known which will specifically overcome the metabolic derangements of a drug-induced coma. The mechanism of action of cerebral stimulant drugs is also unknown, but these drugs presumably act by depressing some inhibiting function in the cell. There is no evidence that any stimulants specifically oppose the cellular metabolic depression induced by depressant drugs such as the barbiturates.*

No specific antidote is known for sedative and hypnotic drugs (*ibid.*, p. 202).

The condition of Laxmibai clearly indicated an impairment of the central nervous system. It is no doubt true that in some cases of coronary thrombosis, coma supervenes; but it is idle to suggest in the present case that Laxmibai was afflicted by this type of coma, because Dr. Jhala who performed the post-mortem examination and opened the coronary arteries found no evidence of thrombosis. According to Otto Saphir, a myocardial infarct is easily detected (*Autopsy*, p. 301-302). Coma in *Laxmibai's* case, as we have shown above, was not the result of acidosis, hypoglycemia, renal failure or meningeal irritation. Her liver, pancreas and kidneys were found to have no pathological lesions and it is significant that no question was even attempted to establish that the opinion of Dr. Jhala on this part of the case was incorrect. Learned counsel for the appellant suggested that the examination by Dr. Jhala might have been superficial, and might not have included a microscopical examination of sections of some of the vital organs normally affected by diabetes. This suggestion, in our opinion ought to have been put forward during the cross-examination of the witness, and it is unfair now to suggest that the opinion that no lesions were found was based on either improper or inadequate examination. We hold that Dr. Jhala performed the examination adequately, and he was also helped by his assistants.

Here, we pause to ask a question of why the appellant brought up the question of hysterical fits at all. He could have said that Laxmibai was a diabetic, and that it was likely she had coma by reasons of that disease. The suggested diagnosis given by the appellant was so unlikely that Dr. Ugale questioned it then and there. There is nothing in the Wanlesswadi T. B. Sanatorium papers or in Dr. Sathe's evidence to show that Laxmibai had hysterical fit after her hysterectomy operation. No suggestion was made to the doctors in court that Laxmibai might have had hysterical fits. The condition of the muscles and the absence of deep reflexes clearly show that this was just another piece the appellant gave the full particulars to Dr. Miss Aneeja. No suggestion was made to her or to Dr. Ugale that any information other than what was noted in the case papers was furnished. There is no case for holding that Laxmibai had a relapse of hysterical fits.

It would, therefore, appear that Laxmibai's condition was not due to any disease, because diseases inducing coma generally leave some trace behind, and also respond to medication. No doubt, in some cases the pathological findings after death from diabetic coma have been negative, but the question is, if this was such a case. We have, on the one hand, the fact that numerous poisons causing coma leave no identifiable trace in the victim after death, and, on the other, that sometimes the autopsy does not disclose any discoverable signs in a patient who dies after an attack of diabetic coma or disease. The appellant can be presumed to have had knowledge of these poisons. The appellant challenged the Advocate General to show from any standard book that the symptoms found by the doctors accorded with any known poison. Here, it must also be remembered that a man with knowledge may manipulate not one but more drugs to achieve his purpose, and the cardinal signs of poisoning on the victim may, as a result, be either obliterated or, at least significantly modified. We give one example on which a certain amount of knowledge is possessed even by laymen. A poison of which one of the symptoms would be the contracting of the pupils of the eyes may be sidetracked by putting into the eyes of the victim a drug like atropine, which by its local action dilates the pupils. We give this example, because most of us know the action of atropine on the eyes, and because the knowledge may confuse the symptoms by a simple trick. We are not suggesting that this is what has happened in this case; but when we have to deal with a case of crime versus natural death, we cannot overlook the possibility of some ingenious artifice having been used to screen the action.

If Laxmibai died in circumstances which *prima facie* admit of either disease or homicide by poisoning, we must look at the conduct of the appellant who brought her to the hospital, and consider to what conclusion that conduct unerringly points. If the appellant as an honest medical man had taken Laxmibai to the hospital and she had died by reason of disease, his conduct would have been entirely different. He would not have taken her to the hospital bereft of property with which she started from home; he would not have given a wrong history of her ailments; he would not have written a letter suggesting that she had a brother in Calcutta, which brother did not exist, he would not have abandoned the corpse to be dealt with by the hospital as an unclaimed body, he would not have attempted to convince the world that she was alive and happily married; he would not have obtained her property by forgeries, impersonation and other tricks indulged in both before and after her death; but he would have informed her relatives and done everything in his power to see that she was properly treated and stayed on to face whatever inquiry the hospital wished to make into the cause of death and not tried to avoid the post-mortem examination and would not have disappeared, never to reappear. His prevarications about where Laxmibai made a big and much varied list, and his forgeries cover scores of documents. In the words of Baron Parke in *Towell's* case.[11]

> *Circumstantial evidence is the only evidence which can in cases of this kind lead to discovery. There is no way of investigating them except by the use of circumstantial evidence: but it most frequently happens that great crimes committed in secret leave behind them some traces, or are accompanied by some circumstances which lead to the discovery and punishment of the offender.....Direct evidence of persons who saw the fact if that proof is offered upon the testimony of men whose veracity you have no reason to doubt is the best proof: but, on the other hand, it is equally true with regard to circumstantial evidence that the circumstances may often be so clearly proved, so closely connected with it, or leading to one result in conclusion. That the mind may be as well-convinced as if it were proved by eye-witnesses.*

The appellant in this case took some risk in taking Laxmibai to the hospital and in giving his name there; and these aspects were, in fact, stressed as arguments in the case. As regards the first part, the argument overlooks that what appears to us to be a risk might not have so appeared to the appellant, who might have been sure of his own ability to screen himself. To him, the death

11. (1854) 2 C and K 309.

of Laxmibai at the hospital without the discovery of poison would be the greatest argument in his favour that he had acted honestly. The second argument is equally unacceptable to us. The appellant could not take the risk of a false name and address if he was intending that the body should be disposed of as unclaimed. By giving his own address he could keep the strings in his own hands. If he gave an address and no reply came from that address, the hospital would suspect foul play. If he gave the address of Laxmibai, people in Poona would know of this mysterious death, and they would remember the death of Purshottam *alias* Arvind in 1954. At that time a post-mortem examination on the body of Arvind was held (*see*, evidence of Ramachandra (P.W. 1), and the explanation of the appellant given in writing on January 22, 1954, is set out below in his own words:

> *My name is Anant Chintaman Lagu, age.....years, residing at No. 431/5, Madiwale Colony, Poona, on being questioned by the state that I am the family doctor of Karve family in H. No. 94/95, Shukrawar. The deceased Purshottam Anant Karve belongs to that family. He came from Bombay to Poona on Saturday, the 16th January, 1954. He had come to me on Sunday the 17th January, 1954, for medicine for weakness. I treated him for 2 days, on 17th and 18th. He had neither told me that there was poisoning in his stomach, nor did I detect any even when I examined and treated him. He became unconscious 5 hours before his death. He was taken to the Sassoon Hospital at 9 P.M. on 18th January, 1954. He was taken to the Sasoon hospital because his disease increased in unconsciousness and also because his mother as also myself and Dr. Joshi were of the same opinion. He died there in about 30 to 45 minutes. The fact that there was deliberate poisoning by somebody, was neither revealed in my examination nor did Purshottam Karve speak to me anything about it during the time I treated him 2 days before. What exactly was the cause of death could not be revealed during my treatment. I do not know if somebody is on bad terms with him. There are rumours about suicide but there is no reason or any circumstance whatsoever for doing so.*

A false address would have started enquiries at the hospital end. Laxmibai's own address would have started speculation in Poona. It was for this reason that the appellant had to choose another place and to trim between fact and fiction, so that he might be able to deal with the matter himself. Of course, Laxmibai did have an address of her own which could have been given, and which did not cease to be her address because she had got an attack of coma, from which people are known to recover.

> ***These arguments, however, are of no avail, in view of the appellant's entire conduct now laid bare, which conduct has been proved to our satisfaction to have begun not after the death of Laxmibai but much earlier. This conduct is so knit together as to make a network of circumstances pointing only to his guilt. The case is one of extreme cunning and premeditation. The appellant, whose duty it was to care for this unfortunate lady as a friend and as her medical adviser, deliberately set about first to ingratiate himself in her good opinion, and becoming her confidante found out all about her affairs. All this time he was planning to get at her property after taking her life. He did not perpetrate his scheme at Poona, where the death might have brought a host of persons to the hospital. He devised a diabolical scheme of unparalleled cunning and committed an almost perfect murder. But murder though it hath no tongue, speaks out sometimes. His method was his own undoing; because even the long arm of coincidence cannot explain the multitude of circumstances against him, and they destroy the presumption of innocence with which law clothes him.***

In our judgment, the two courts below were perfectly correct in their conclusion that the death of Laxmibai was the result of the administration of some unrecognised poison or drug which would act as a poison, and that the appellant was the person who administered it. We accordingly confirm the conviction.

11.12.2 Proof of Poisoning[12]

11.12.2.1 Relevant Extracts Verbatim

The essential ingredients in a case of poisoning are no longer in doubt. The matter is concluded by a series of Supreme Court decisions. In *Anant Chintaman Lagu v State of Bombay*[13], their lordships pronounced that the prosecution establishes three propositions in a case of poisoning:

(i) Death took place by poisoning;

(ii) Accused had the poison in his possession; and

(iii) Accused had the opportunity to administer poison to the deceased.

In this case, Arundhati had the poison in her possession and in fact administered the same and death took place by poisoning Thus, the entire elements essential for a conviction are found.

In paragraph 59 their lordships laid down that though the three propositions must always be kept in mind, the sufficiency of the evidence, direct or circumstantial, to establish murder by poisoning will depend on the facts of each case. If the circumstantial evidence, in the absence of direct proof of the three elements, is so decisive that the court can unhesitatingly hold that the death was a result of administration of poison and that the poison must have been administered by the accused person, then the conviction can be rested on it.

The circumstantial chain in this case is complete. The moment oleander was administered, the deceased complained bitter taste, burning sensation and drying up of the tongue and throat. Soon after he died. There can be no escape from the conclusion that death was due to poisoning

It would be too much to expect the prosecution to establish that the accused knew that what was administered was poison. The answer to it is furnished in paragraph 65 of the aforesaid Supreme Court decision. Their Lordships observed thus:

> *A case of murder by administration of poison is almost always one of secrecy. The poisoner seldom takes another into his confidence, and his preparations for the commission of the offence are also secret. He watches his opportunity and administers the poison in a manner calculated to avoid its detection. The greater his knowledge of poisons, the greater the secrecy, and consequently the greater the difficulty of proving the case against him. What assistance a man of science can give, he gives; but it is too much to say that the guilt of the accused must, in all cases, be demonstrated by the isolation of the poison, though in a case where there is nothing else such a course would be incumbent upon the prosecution.*

In *Emperor v Shetya Timma*[14], the death was caused by Dhatura poisoning After review of conflicting decisions on the point, their lordships held that where the accused administered *Dhatura* poison to five men in order to facilitate commission of robbery and in consequence thereof three men died, the accused must be presumed to have knowledge that their act was so dangerous that it was likely to cause death. The acquittal of the charge under section 302, Indian Penal Code, was set aside. The same view was taken in *Emperor v Chattarpal,*[15] in that case a woman of middle age administered her husband with arsenic disguised in sugar and placed in his food. Their lordships said that she must accept the full responsibility of her action which resulted in death. Cases where such drugs are administered on the genuine impression that they would act as love philtres and would not cause the death of the person to whom they were administered were noticed and distinguished.

12. *Arundhati Keutuni v State of Orissa*, 34 Cut LT 60 : ILR 1967 Cut 951 : 1968 Cr LJ 848 (Ori).
13. AIR 1960 SC 500 : (1960) 2 SCR 460 : 1960 Cr LJ 682.
14. AIR 1926 Bom 518 : 27 Cr LJ 1134.
15. AIR 1930 Oudh 502.

On the principles enunciated in the aforesaid decisions we are clearly of opinion that Arundhati was guilty of the murder of the deceased by poisoning.

11.12.3 Identification of Poisoning[16]

Relevant Extracts Verbatim

The aforesaid three propositions are not the invariable criteria of proof by direct evidence. Reasons are apparent. If after the poisoning of the victim his body is destroyed, the first proposition is incapable of proof except by circumstantial evidence. Similarly if the accused gave the victim something to eat and the victim died immediately on the food being taken with symptoms of poisoning, and poison in fact was found in the viscera, the necessity of proving the second ingredient would fall as a matter of reasonable inference from the circumstance that the accused gave the victim something to eat. The element that the accused was in possession of poison need not be separately proved in such a case (see *Anant Chintaman Lagu v State of Bombay*,[17] paras 58 and 59; and *Mohan v State of Uttar Pradesh)*[18].

The quantum of circumstantial evidence must be such as to lead to the inference that the guilt of the accused is established beyond reasonable doubt and that the circumstances are wholly incompatible with the innocence of the accused.

* * * * *

The report of the chemical examiner (Ex. 4) is that the viscera and the *chatni* contained Oleander poison. The only point for consideration in this regard is whether both were properly preserved. The doctor (P.W. 6) preserved the viscera and sent it for chemical examination. It appears from Ex. 4 that alcohol as well as Oleander were detected in the viscera of the deceased. Mr. Ray relied on section 510, Cr.P.C., and contended that Ex. 4 was not admissible in evidence, it was not duly submitted for examination in the course of any proceeding under the Code. For proper appreciation the section may be quoted:

Section 510 *Report of chemical examiner.*—(1) Any document purporting to be a report under the hand of any Chemical Examiner or Assistant Chemical Examiner to Government or the Chief Inspector of Explosives or the Director of Finger Print Bureau or an officer of the Mint upon any matter or thing duly submitted to him for examination or analysis and report in the course of any proceeding under this Code, may be used as evidence in any enquiry, trial, or other proceeding under this Code.

(2) The court may, if it thinks fit, and shall on the application of the prosecution or the accused, summon and examine any such person as to the subject-matter of his report."

Ex. 4 shows that the doctor (P.W. 6) despatched the viscera for examination on 4-5-1962. Mr. Ray argued that the viscera was not duly submitted in the course of any proceeding under the Code. The F.I.R. was lodged on 13-3-1962 and the investigation started thereafter. There is absolutely no basis for the suggestion that the viscera was not submitted in the course of proceeding Much emphasis was laid on the words "duly submitted". Mr. Ray contended that the viscera should have been sent by investigating officer and not by the doctor (P.W. 6) to the chemical examiner. The word "duly" means "properly". This word only emphasises the fact that proof of identity of the article sent to the chemical examiner with articles examined by him must be established. There is no substance in this contention. Ex. 4 merely states that oleander was detected in the viscera. No reasons have been given as to how the chemical examiner came to this conclusion. By Central Act 26 of 1955, sub-section (2) has been inserted to section 510. It was open to the accused to summon and

16. *State of Orissa v Kaushalya Dei*, AIR 1965 Ori 38 : (1965) 1 Cr LJ 321 (Ori).
17. AIR 1960 SC 500 : (1960) 2 SCR 460 : 1960 Cr LJ 682.
18. Cri App No. 98 of 1958 (SC).

examine the chemical examiner. There is, therefore, no escape from the conclusion that the viscera was duly submitted for chemical examination in the course of investigation and Ex. 4 is admissible in evidence without the examination of the chemical examiner.

* * * * *

The doctor (P.W. 6) who conducted the post-mortem examination, reserved his opinion as to the cause of death until receipt of the report (Ex. 4). He gave a positive opinion that the cause of death was due to poisoning He found the brain and the membrane congested. The right side of the heart was full with dark thick blood and the left side was empty. The liver and the spleen were also congested. The gall-bladder was full. He also asserted that his post-mortem findings lead to the conclusion that death was the result of poisoning Thus, the doctor categorically asserted that the death was due to poisoning and his opinion was based on his post-mortem findings as well as on the report of the chemical examiner (Ex. 4).

Cross-examination of this witness was declined by the defense. Though alcohol was found in the viscera, not a single question was suggested that death was due to alcohol poisoning or that the symptoms were consistent with the alcohol poisoning Neither a question was put to the doctor that in the absence of a report by the chemical examiner regarding the quantity of oleander administered, no opinion could be given that death was due to poisoning by oleander. In the absence of such cross-examination and in the face of the unchallenged testimony of the doctor, the learned Sessions Judge was not justified in indulging in speculative argument on the basis of the existence of alcohol in the viscera and in the absence of a report regarding the quantity of the oleander. In this connection, it is instructive to refer to para 11, in *Mohan v State of Uttar Pradesh,*[1] where their Lordships observed:

> It is enough for us to say in regard to this contention that no question had been put to any witness to elicit what symptoms would appear in a case of arsenic poisoning The medical evidence is clear that death was due to arsenic poisoning
>
> * * * * *
>
> *To summarize, there is unimpeachable evidence that the viscera and the chatni contained oleander poison. The unchallenged testimony of the doctor (P.W. 6) is that death was due to oleander poisoning The statements made by the deceased at three different stages that the chatni served to him by the accused, tasted bitter received full corroboration from the findings on chemical tests and the medical opinion. The chain of circumstantial evidence is complete and no link is missing to come to a conclusion beyond reasonable doubt that the deceased died of poisoning arising out of the service of the chatni by the accused. The conduct of the accused in running away from the house next morning and her false explanation that she did not serve any food to her husband are consistent with the prosecution story.*

We are aware of our responsibility in setting aside the order of acquittal. The presumption of innocence of the accused has been reinforced by the factum of acquittal. The court has, however, plenary powers to go through the evidence and come to its own conclusion about the truth of the matter. After giving our anxious consideration of the materials on record and after closely examining the various reasons given by the learned Sessions Judge, we are satisfied that the view taken by the learned Sessions Judge is clearly an unreasonable one and cannot be sustained.

11.12.4 Proof of Possession of Poison[19]

Relevant Extracts Verbatim

The learned advocate for the appellant has first contended that the conviction is wrong in law in view of the decision of this court in *Dharambir v Punjab.*[2] That was a case of murder by poisoning. It was there said:

> *Three questions arise in all such cases,* viz.*,*
>
> firstly*, did the deceased die of the poison in question?*
>
> Secondly*, had the accused the poison in question in his possession? And,*
>
> thirdly*, had the accused an opportunity to administer the poison to the deceased? Therefore, along with the motive the prosecution has also to establish that the deceased died of a particular poison said to have been administered, that the accused was in possession of that poison and that he had the opportunity to administer the same to the deceased.....*

The learned advocate contended that in the present case, the second element stated in the above mentioned case, namely, proof of the possession of the poison by the appellant wanted we feel that this contention is wholly unfounded. The evidence in this case shows that the appellant gave Ram Bharosey the '*peras*' and within half an hour he became ill and died within two hours. It is also clear from the evidence that the food which Ram Bharosey had taken before noon did not contain arsenic or any other poison for chameli also took the same food and suffered no ill-effect whatever. There is further no evidence that in the field Ram Bharosey took any food apart from the '*peras*' given to him by the appellant. Lastly, of course, it is clear from the result of the chemical examination that he had died of arsenic poisoning The court below found from all this – a finding to which in our opinion no exception can be taken – that the arsenic was contained in the '*peras*' given by the appellant to Ram Bharosey.....

Now, it seems to us that if there was arsenic in the *peras* which the appellant gave to Ram Bharose, it inevitably follows that the appellant was in possession of arsenic before he gave them to Ram Bharosey.

> *The next point of the learned advocate is that there were no signs of corrosion in the stomach or of the nails having turned blue and no other symptoms indicative of arsenic poisoning It is enough for us to say in this regard that no question had been put to any witness to elicit what symptoms would appear in a case of arsenic poisoning The medical evidence is clear that death was due to arsenic poisoning.*

11.12.5 Oedema due to poisoning[20]

Relevant Extracts Verbatim

The two doctors have proceeded by the process of elimination. They noticed that all the organs of the deceased were healthy and there was no sign of any disease in any one of the organs such as brain, heart, lung and kidney. There could not, therefore, be any natural disease to any of these organs. That means that pulmonary oedema could not be the result of disease to any of these organs. So far as broncho-pneumonia is concerned, the two doctors maintained that broncho-pneumonia was secondary to pulmonary oedema. Had pneumonia been of Iobar origin, it may be possible to maintain that the pulmonary oedema was the result of pneumonia. *Having ruled out the possibility of death being due to any natural causes, the two doctors addressed themselves to the question as to what could be the possible cause of death. They concentrated their*

19. *Mohan v State of Uttar Pradesh*, AIR 1960 SC 659 : 1960 Cr LJ 1011.
20. Re *Palaniswamy Vaipuri,* 1963 Cr LJ 453 (Bom).

attention upon the presence of pulmonary oedema, which was primary and not consequence of disease to any of the vital organs which may lead to the appearance of pulmonary oedema. Therefore, they posed the question whether pulmonary oedema could be the result of administration of any foreign agent, and they were forced to the conclusion that it could only be the result of entry of a foreign agent in the body. How this entry was effected, of course could not be stated by the experts. The drug could be inhaled, could be orally administered and could be injected. The effects would be the same whatever the manner of the administration of the drug This then is the summary of the views expressed by the two doctors.

It would thus be seen that there are some poisons particularly vegetable poisons and also fungi and mushrooms for which there are no reliable tests of identification of poison, and there are some, which cannot be detected by any known method of isolation because of various factors such as absorption, evaporation and ejectment of urine, blood, It is settled law that merely because the poison has not been isolated in chemical examination, it does not follow that no poison was administered. *Once it is decided that pulmonary oedema, which made its appearance in the case of deceased, could not be due to the pathological condition prevailing in any of the organic tissues, it must follow that pulmonary oedema was the result of administration of an outside agent. Pulmonary oedema could be the effect or could be secondary to some primary cause such as, disease. But, when that primary cause is absent, it would be reasonable to assume that pulmonary oedema has been caused by the entry of a foreign agent which has exercised a catalytic influence on certain organs of the body particularly, the lungs in the present case.*

Before leaving this aspect of the matter, we may refer to one more argument that was advanced by Mr. Kode. Mr. Kode referred to the table on p 267 in *Snyder's Homicide Investigation* 1958, and pointed out that blood is one of the organs in which poison remains mixed and thus becomes amenable to deduction in the case of most of the poisons. In this connection he referred to the fact that according to Sub-Inspector Kumbhojkar, a sample of blood of the deceased was sent to the chemical analyser for chemical analysis. This assistant chemical analyser, D'Mello has stated that blood was sent for determining the blood group and that it was not suitable for analysis, because the blood had broken down, Mr. Kode complained that, as a matter of fact, the blood of the deceased should have been sent to the chemical analyser for detection of poison, if any, in the blood. No questions have been asked to Dr. Vaidya as to the purpose for which the blood was sent/for chemical analysis. It, however, appears from the evidence of D' Mello as also Exhibit 106 that the blood was sent for analysis for the purpose of determining the blood group. Whatever the purpose for which the blood was examined by the chemical analyser, it is clear that the blood had broken down and, therefore, was not/suitable for any kind of chemical analysis. *Prima facie*, therefore, it does not appear to us that any useful purpose would have been served by asking the chemical analyser to examine the blood for the purpose of finding out whether there was any element of poison therein. Incidentally, we may refer to pp 263 and 264 of *Snyder's Homicide Investigation*. On p 263 under the heading 'Medical Notes on Poisoning' the author has stated:

> *In attempting to isolate and identify poison in a dead body, two questions confront the lexicologist. These are:*
>
> *1. Is embalming likely to interfere with the analysis?*
>
> *2. What is the tendency for poison to disappear in the dead body? On p 264 under the heading 'Disappearance of Poison in the Dead Body' the author has stated:*
>
> *...Some poisons disappear rapidly after death, while others may be found after several years.*

11.12.6 Non-identification of Poison[21]

Relevant Extracts Verbatim

The trial court and the High Court in the light of the evidence on record were of the opinion that the death of Indira by morphine poisoning could not be ruled out. According to Taylor's *Principles and Practice of Medical Jurisprudence*, vol II, 12th Edn, p. 199, poison can be administered not only orally but also hypodermically or intravascularly with the help of a syringe. As there was no eyewitness of the occurrence, the court should not, in our opinion, insist upon evidence regarding the exact manner in which the death of Indira was caused. It has to be borne in mind in this context that Mahabir accused was responsible for the removal of the dead body immediately after the death of Indira and the same remained submerged in water for more than 24 hours. The above conduct of Mahabir accused prevented prompt post-mortem examination on the dead body of Indira. On the material it can be said that there were some features like the congestion of both the lungs, the kidney, the liver and the spleen of Indira which, according to Dr. Kamleshwar Singh were indicative of death by respiratory failure and the same could be caused by poisoning The fact that the heart of the deceased at the time of post-mortem examination was found to be empty would not rule out a physical death as a result of poisoning According to observations on page 125 of Modi's *Medical Jurisprudence and Toxicology*, Seventeenth Edition, in many cases of asphyxial deaths both the sides of the heart are found to be full if examined soon after death but after *rigor mortis* has set in, the heart is found contracted and empty. Reference has been made by Mr. Chari to report dated 23 December, 1963 of the chemical examiner, according to whom no poison could be detected in viscera of Indira deceased. This circumstance would not, in our opinion, militate against the conclusion that the death of the deceased was due to poisoning There are several poisons particularly of the synthetic hypnotics and vegetable alkaloid groups, which do not leave any characteristics signs as can be noticed on post-mortem examination. We may in this context refer to the following observations on page 477 of the above mentioned book by Modi:

> *It is quite possible that a person may die from the effects of a poison and yet none may be found in the body after death, if the whole of the poison has disappeared from the lungs by evaporation, or has been removed from the stomach and intestines by vomiting and purging, and after absorption has been detoxified, conjugated and eliminated from the system by the kidneys and other channels. Certain vegetable poisons may not be detected in the viscera, as they have no reliable tests, while some organic poisons, especially the alkaloids and glucosides, may by oxidation during life or by putrefaction after death, be split up into other substances which have no characteristic reactions sufficient for their identification.*

Similar view has been expressed by Lambert in his book "*The Medico Legal Post Mortem in India*". We may also in this context refer to the book "*Legal Medicine, Pathology and Toxicology*" by Gonzales and others. Second Edition, wherein it is stated on page 847:

> *The post-mortem appearances in cases of morphine poisoning are not particularly characteristic. There is a congestion of the viscera, cyanosis and abundant dark fluid blood. When crude opium is taken by mouth the stomach may contain fragments of poppy but nothing characteristic is found if morphine is ingested.*

The circumstances of the present case taken in their entirety clearly point to the conclusion that the death of Indira was not natural but was due to foul play. In a number of cases where the deceased dies as a result of poisoning, it is difficult to successfully isolate the poison and recognise it. Lack of positive evidence in this respect would not result in throwing out the entire prosecution case if the other circumstances clearly point to the guilt of the accused.

21. *Mahabir Mandal v State of Bihar*, AIR 1972 SC 1331 : 1972 Cr LJ 860 : 1972 Pat LJR 263.

Reference in this context may be made to the observations of Hidayatullah, J., (as he then was) who spoke for the majority in the case of *Anant Chintaman Lagu v State of Bombay*.[22]

* * * * *

Reliance in the above context was placed in the cited case on the books on medical jurisprudence by different authors wherein it has been stated that the pathologist's part in the diagnosis of poisoning is secondary and that several poisons particularly of the synthetic hypnotics and vegetable alkaloid groups do not leave any characteristic signs which can be noticed on post-mortem examination.

* * * * *

The case against Mahabir accused, in our opinion, is covered by the latter part of the above observation. We, therefore, find no cogent ground to interfere with the findings of the two courts that the death of the deceased was not natural but homicidal.[2]

11.12.7 Fatal Dose[23]

Relevant Extracts Verbatim

We are also of the opinion that the courts below were right in concluding that death resulted from poisoning. It is true that Dr. Patodia could not say what poison caused her death. But he could say that death was due to something that was an irritant, and it could be due to dhatura or belladonna or any other poison. The deceased, according to the Ghisaji, P.W. 3, was a healthy woman, and had not taken any other medicine before arriving at the clinic. She was at the clinic from 9 A.M. till she died. The only medicine she took, apart from antidotes, was what was administered, *i.e*., 24 drops of stramonium and a *dhatura* leaf. She started feeling restless and ill soon after taking these things. On these facts the conclusion of the courts below that death was the result of *dhatura* poison cannot be said to be erroneous.

Dr. Choudhary, P.W. 17, registered medical practitioner, in the course of his evidence, stated:

> *In the opinion of Dr. Modi, the writer of Medical Jurisprudence, a dose of 20 to 20.5 grains of* dhatura *is fatal and according to Dr. Taylor about 16 grains of it is a fatal dose. Therefore, I can say that if a fresh leaf of* dhatura *of 6 inches length and 4 inches breadth along with 24 drops of stramonium mother tincture of Homoeopathic preparation is given to any patient then the joint effect of both may be fatal and if it is kept in mind that the patient is allergic and idiosyncratic for stramonium then such a dose may be fatal.*

This is relied on by the learned Sessions Judge to determine what would be the fatal dose. We have, however, looked up Modi's *Medical Jurisprudence and Toxicology* (14th Edn); and Taylor's *Principles and Practice of Medical Jurisprudence* (11th Edn.); but they do not quite say what Dr. Choudhary had assumed. Modi writes at p 713 thus:

> Fatal Dose—*Uncertain—Four* dhatura *fruits pounded and mixed with flour were given to six men, four of whom died. A ripe fruit weighs, on an average, about a drachm, and contains the seeds which weigh about 1/2 drachm. One hundred dried* dhatura *seeds weigh 20 to 20.5 grains. A decoction of 125 seeds of* dhatura *stramonium has proved fatal to a woman.*

According to Taylor (p 551, Vol. II):

> Toxicity and Fatal Dose.—*The active principle, a mixture of hyoscine, atropine and hyoscyamine, is extremely toxic, and as the plant contains approximately 1/2 to 1 per cent. of alkaloids, it must be considered extremely dangerous. The seeds are highly poisonous, inasmuch*

22. AIR 1960 SC 500 : (1960) 2 SCR 460 : 1960 Cr LJ 682 (SC).
23. *Juggankhan v State of Madhya Pradesh*, AIR 1965 SC 831 : (1965) 1 SCWR 796 : (1965) 1 Cr LJ 763 (SC).

as they contain a larger proportion of alkaloids than other parts of the plant. Death may take place although the whole of the seeds are ejected.

A child of 2 years swallowed about 100 seeds stramonium weighing 16 grains. The usual symptoms were manifested in an hour, and the child died in 24 hours although twenty seeds had been ejected by vomiting and eighty by purging Sufficient alkaloid to destroy life had been absorbed from the entire seeds and carried into the blood.

In a case which became the subject of a trial at Osnabruck, a woman administered to her mother a decoction of the bruised seeds of the thorn-apple, of which it was supposed there were about 125. She very soon became delirious, threw her arms about and spoke incoherently; she died in 7 hours.

Dr. Patodia (P.W. 7) could not definitely say what dose of tincture stramonium should be sufficiently fatal to life. But he further opined that half an ounce of tincture stramonium, which is insufficient excess of the normal medicinal dose (which he put at 10 to 30 drops) will be sufficient to cause death.

On this material we cannot say that it has been established that what the appellant prescribed was necessarily a fatal dose. Further, the finding of the learned Sessions Judge that the leaf weighed 40 grains and the poison content would be 15 grains does not proceed on any sound basis. Ghisaji described the leaf as a big one but it was green and fresh. Laxminarayan Vaidya, P.W. 13 gave the dimensions of the biggest leaf as having a length of 7 inches and breadth of 3-½ inches grown on the land having the application of manure. Dr. Choudhary, P.W. 17, said that "on the basis of hypothesis that if a fresh leaf of dhatura is 6 inches in length and 4 inches in breadth and is 40 grains in weight, it would contain 27 grains moisture and 13 grains of solid stramonium, *i.e.*, poison." We think that this hypothetical evidence should not have been relied upon to determine the content of solid stramonium in the leaf alleged to have been administered to the deceased. It follows from this that poisonous contents of the leaf have not been satisfactorily established and if this is so, the prosecution has failed to prove that the dose given to the deceased was necessarily fatal. Further, Dr. Choudhary stated that it had not come to his notice that in any of the Homoeopathic systems of medicine stramonium mother tincture or stramonium in potentized form or a green leaf of dhatura is not given for treatment of guinea-worm. According to Dr. R.K. Singh, P.W. 16, mother tincture stramonium can be given for removing foreign bodies, though it is not specifically mentioned in *Materia Medica of Homoeopathy* that it can be used for treatment of guinea worm. But it will be remembered that in this system treatment is by symptoms.

11.12.8 Fatal Dose not Given[24]

Relevant Extracts Verbatim

One point argued by the learned counsel for the appellant was that motive not having been established, it was necessary for the prosecution to prove that in administering aconite to Sundar Singh the intention of the appellant was to kill him. According to the learned counsel such an intention had not been proved as there is nothing in the chemical examiner's report to show that the aconite found in the stomach contents of the deceased was of a fatal variety. He referred to the fact, mentioned in almost all the books on medical jurisprudence and toxicology, that a root of aconite is often used both externally and internally by '*Vaids*' and '*Hakims*' in this country, and that it is also sometimes added to country-made liquors to increase their intoxicating power.

He also argued that the poisoning may have been accidental. He further cited, '*In re Chinna Hanumakka,*[25] in connection with the question of intention. Motive having however been

24. *Findal v State of Himachal Pradesh*, 1953 Cr LJ 1900 (HP).
25. AIR 1943 Mad 396 : 44 Cr LJ 550 : ILR (1943) Mad 679.

established, no question of intention arises on the showing of the learned counsel for the appellant himself. It may, however, be stated that it is immaterial that the prosecution has adduced no evidence as to the particular variety of aconite used in the present case. And this for the reason that the nature of the variety used in the present case appears from the result produced by it. Sundar Singh died within three hours of the poisoning It is apparent, therefore, that the aconite used in the present case was sufficient both in quality and quantity to produce fatal results. There could, in the circumstance, be no doubt about the intention of the appellant, for a person who administers to another aconite producing fatal results within 3 hours cannot but have the intention of killing him.

The Madras ruling cited by the learned counsel for the appellant has no relevancy since in that case the accused pleaded that she gave aconite to her husband not with the intention of causing his death but with the intention of making him mad. The appellant in the present case did not plead that he had any other intention than of causing the death of Sundar Singh in mixing aconite powder with the tea. In any case, a person who administers aconite of such quality and in such quantity to another as results in his death within three hours must be taken to know that his act is so imminently dangerous that it must in all probability cause death or such bodily injury as is likely to cause death, and if death ensues, he is guilty of murder, notwithstanding that his intention may not have been to cause death. *See* para 4 of the definition of murder in section 300, Penal Code—*Emperor v Gauri Shankar*.[26] There could also be no question of accidental poisoning in this case since aconite was not administered by some quack in a drug, nor was it administered in liquor to increase its intoxicating power.[4]

11.12.9 Quantitation Essential[27]

Relevant Extracts Verbatim

The civil surgeon of Bareilly conducted the post-mortem examination of the dead body of Sudarshan Puri on 18th of April, 1953 at 9.55 in the morning He found the nails of thumbs and fingers blue. The skin at tips of fingers and thumbs was cyanosed. The membranes of the brain were hyperaemic. Both lungs were congested. Both sides of the heart contained blood and ecchymosis under the endocardium and in the muscles of the left ventricle. The liver, the spleen and the kidneys were congested.

Examination of the stomach revealed that the mucous membrane was swollen and softened and there were patches of congestion. The stomach had four ounces of brownish watery fluid with flakes of mucous and gritty whitish sandy particles which were also embedded in the mucous membrane. The small intestines showed that mucous membranes were swollen, flabby and congested.

The viscera was preserved by the civil surgeon for examination by the chemical examiner. In the opinion of the civil surgeon death was due to arsenic poisoning

The report of the chemical examiner indicated that arsenic was detected in portions of viscera of Sudarshan Puri and traces of arsenic were also discovered in the vomitus of Sudarshan Puri. Traces of opium were also discovered in portions of the viscera of Sudarshan Puri. Arsenic was also detected by the chemical examiner in two of the phials bearing the labels Liquor Arsenicalis P.B.I.M.S. Laboratory Ltd, Lucknow and Liquor Arsenicalis, P.B. Verma Medical Stores, Chandausi, and opium was detected in one of the phials marked as Tinct. Opii

26. AIR 1918 All 283 : ILR 40 All 360 : 19 Cr LJ 382.
27. *State of Uttar Pradesh v Fateh Bahadur,* AIR 1958 All 1 : 1958 Cr LJ 1 (All).
Also see: Re *Hanumantha Rao*, AIR 1957 AP 456 : 1956 Andh WR 360 : 1957 Cr LJ 930 (AP); *Basu v State of Bihar*, 1957 Cr LJ 990 (Pat).

Camphoreta B.P. 48, Bengal Chemical and Pharmaceutical Works Limited, Calcutta. The report of the chemical examiner did not disclose any result on the basis of a quantitative test.

As has been observed by Modi in his *Medical Jurisprudence*, Twelfth Edition (1955) at page 513, "When administered in a soluble form by the mouth arsenic gets absorbed into the blood almost in a few minutes, but when taken in solid lumps, it may not be absorbed by the stomach and sometimes passes out with the faeces without producing any poisonous symptoms. The report of the chemical examiner in our opinion is wholly insufficient to prove that the cause of death of Sudarshan Puri in this case was arsenic poisoning A very small and harmless quantity of arsenic can be detected by the Reinsch or Marsh Test.

As far back as 1930, a Bench of this court held, in *Emperor v Sikandar,*[28] that it is of the utmost importance in a case of arsenic poisoning that the prosecution should prove that a lethal dose of arsenic, that is two grains or upwards, had been administered. In India, arsenic is used as a medicine in all manner of diseases. It is therefore impossible to take the mere evidence that arsenic was detected as sufficient to prove conclusively that death was from arsenic poisoning

It is of the utmost importance before a court can find any individual guilty of murder by the administration of arsenic that a more complete analysis should be made than done in this case. That such analysis has been made in India in the past is clear from a reference to Dr. Cheyer's *Medical Jurisprudence* published in 1870, where he observed at page 116:

> *Dr. MacNamara discovered considerable quantities of arsenic in both stomachs.*

Given the necessary knowledge and the necessary instruments, modern science has no difficulty in coming to a conclusion as to the approximate quantity administered.

A similar question came up for consideration by another Bench in *Happu v Emperor*,[29] and there too it was observed that if the prosecution wishes to establish that the deceased died of arsenic poisoning by the report of chemical examiner, and weight is to be attached to his evidence, it must be proved that at least two grains of arsenic were administered to the deceased before death. He can do this by proving the discovery of this amount in the body of the deceased or by accounting for its absence in part. He may attribute the loss by vomiting, purging or the natural elimination of the poison from the body before death.

It was further observed in that case that where a man's life is in the balance and where the whole case depends upon an answer to the question whether a fatal dose was or was not administered to the deceased, it is a matter for consideration whether the Sessions Court should not whenever it is of opinion that such action is necessary for the ends of justice, exercise its right to call the chemical examiner so that he may be examined on oath and subjected to cross-examination; and that when a report is received from the chemical examiner containing a quantitative analysis it should be shown to the medical officer who conducted the post-mortem examination so that he will be in a position to state what are the medico-legal inferences to be drawn from the report. In the present case, there is a complete absence of evidence on the point.

11.12.10 Poisoning: Suicidal/homicidal/accidental?[30]

Relevant Extracts Verbatim

The prosecution case is that Sardar Jaspal was administered potassium cyanide poison by the appellant and Mohinderpal on the afternoon of 6-2-1950. The dead body was then put into a large trunk and kept in one of the rooms in the house in Ambala City. About ten days later, *i.e.*,

28. AIR 1930 All 532 : 31 Cr LJ 862.
29. AIR 1933 All 837 : (1933) 35 Cr LJ 280 : ILR 56 All 228.
30. *Palvinder Kaur v State of Punjab*, AIR 1952 SC 354 : 1953 SCR 94 : 1953 Cr LJ 154.

on 16-2-1950, Mohinderpal during the absence of the appellant, removed the trunk from the house in a jeep when he came there with Amrik Singh and Kartar Singh (P.Ws), two watermen of the Baldevnagar Camp. The trunk was then taken to Baldevnagar Camp and was kept in a store room there. Three days later, on 19-2-1950, Mohinderpal accompanied by Palvinder and a domestic servant, Trilok Chand (P.W. 27), took the trunk a few miles on the road leading to Rajpura, got on to a *katcha* road and in the vicinity of village Chapt took the jeep to a well on a mound and threw the box into it. The jeep was taken to a *gurdwara* where it was washed.

It held that though the body found from the well was not capable of identification, the clothes recovered from the trunk and found on the body proved that it was the body of Jaspal. It further held that the cause of death could not be ascertained from the medical evidence given in the case. The evidence on the question of the identity of the dead body consisted of the statement of constable Lachhman Singh, of the clothes and other articles recovered from inside the trunk and of alleged confession of the accused.

Whether Jaspal committed suicide or died of poison taken by mistake, or whether poison was administered to him by the appellant or by Mohinderpal or by both of them are questions the answers to which have been left very vague and indefinite by the circumstantial evidence in the case. In view of the situation of the parties and the belated investigation of the case and the sensation it created it was absolutely necessary for the courts below to safeguard themselves against the danger of basing their conclusions on suspicion howsoever strong. It seems to us that the trial court and to a certain extent the High Court fell into the same error against which warning was given by Baron Alderson in *Reg v Hodge,*[31] where he said as follows:

> *The mind was apt to take a pleasure in adapting circumstances to one another, and even in straining them a little, if need be, to force them to form parts of one connected whole, and the more ingenious the mind of the individual, the more likely was it, considering such matters, to over-reach and mislead itself, to supply some little link that is wanting, to take for granted some facts consistent with its previous theories and necessary to render them complete.*

We had recently occasion to emphasise this point in *Hanumant Govind Nargundkar v State of Madhya Pradesh.*[32]

In order to establish the charge under section 201, Penal Code, it is essential to prove that an offence had been committed, – mere suspicion that it has been committed and with the requisite knowledge and with the intent to screen the offender from legal punishment causes the evidence thereof to disappear or gives false information respecting such offences knowing or having reason to believe the same to be false. It was essential in these circumstances for the prosecution to establish affirmatively that the death of Jaspal was caused by the administration of potassium cyanide by some (the appellant having been acquitted of this charge) and that she had reason to believe that it was so caused and with that knowledge she took part in the concealment and disposal of the dead body. There is no evidence whatsoever on this point.

11.12.11 Morphine (Morphia) Poisoning and asphyxia[33]

Relevant Extracts Verbatim

The Kotwal then went to the house of Yashwant Rao, which was very near the maternity ward. In the meanwhile the accused absconded. The Kotwal and the police with the father

31. (1838) 2 Lewin.
32. Criminal Appeal No. 56 and 57 of 1951 SC.
33. *Narain Rao Jamdar v State of Madhya Bharat*, AIR 1952 MB 25 : 1952 Cr LJ 261 (MB).
Also see: *State of Himachal Pradesh v Shiv Devi*, AIR 1959 HP 3 : 1959 Cr LJ 448; *Hadu v State of Orissa*, AIR 1951 Ori 53 : 1950 Cut 509; *State Government Madhya Pradesh v Ramkrishna Ganpatrao Limsey*, AIR 1954 SC 20 : 1954 Cr LJ 244 (SC).

of the accused and other persons went inside the house. In the sleeping room of the accused, above his cot, there was a wooden plank fixed on which the basket was found and nearby in a corner were found the cow-dung cakes. Babu (P.W. 1) identified these as belonging to the deceased. On the left side of the room was a staircase, which was locked. The lock was broken and the party went to the roof. On the left side was a sort of verandah with three doors which were closed. The doors were opened, and after entering the Kotha they found a very small room which was also closed. Opening it the dead body of Mahila Dhanno was found in it. The body was lying on its back. The mouth was stuffed with a handkerchief and on it was tied a langot; eyes were closed; private parts and breast were uncovered and there were many marks of abrasions on both side of the breast. Dr. V.R. Sapkal (P.W, 2) who performed the autopsy on 6 February 1950 was of opinion that there were nearly ten abrasions on the right side of the breast and a big abrasion with a diameter of it, 1.25" on the nipple, left side. This was most probably due to human bite. No scratches or wounds could be detected near the private parts; hymen being old ruptured. The stomach and small intestines and oesophagus were inflamed; lungs, liver, spleen, kidneys being congested. The right side of the heart was full of blood and the left empty. According to him, the cause of death was asphyxia and irritant poison. The viscera were sent for chemical examination; and opium was found in them. Examined as a witness Mr. Shankar Rao (P.W. 8), the chief chemist, deposed that he was unable to say whether the morphia which he found was the result of partaking of opium in the form in which it is usually taken or of partaking of some preparation containing morphia. He could not tell the quantity of opium taken or the time before death at which it could have been taken. The fatal dose being one grain of morphia or four grains of opium, it is difficult to say whether so much opium or morphia was in fact administered. The police failed to discover any morphia or opium in the house. It is possible that the fatal dose may not have been given but some preparation may have been given in order to break the resistance, if any. The slides containing vaginal discharge were negative for semen and no spermatozoa could be traced. The examination of the *lehenga* and *dhoti* of the deceased also indicate the same result.

From the above, it is evident that attempts were made to have sexual intercourse with the unfortunate female forcibly and deceased continued to resist. Then, in order to silence her, a handkerchief was stuffed into the deceased's mouth and *langot* was tied over it. It appears that the female died due to suffocation before the offender could commence sexual intercourse.

11.12.12 Acid Burns[34]

Dr. V.K. Jain, who treated Maya Devi in the city clinic has stated in his evidence that the injuries suffered by Maya Devi were sufficient collectively, in the ordinary course of nature, to cause death. The opinion of Dr. Jain is corroborated by the evidence of Dr. K.S. Raj Kumar. He said that the burns were to the extent of 35 per cent of the body that if the burn exceeded 30 per cent, the same would be dangerous to life and that the injuries on Maya Devi were dangerous to life. Dr. S.S. Kaushal who conducted the post-mortem examination was of the view that death was due to toxaemia and septicemia from absorption of toxins on account of the extensive superficial ulceration of the body caused by some corrosive material. The evidence of these doctors would show that the injuries caused to Maya Devi were of a dangerous character. The fact that Maya Devi lingered for about 12 days would not show that the death was not the direct result of the act of the appellant in throwing acid on her. The medical evidence is

34. *Sudarshan Kumar v The State of Delhi*, 1974 AIR 2328 : 1975 SCR (2) 520 : 1975 Cr LJ 14 (SC).

clear that 35% of the surface of the body of Maya Devi was burnt as a result of the injuries received by her.

> The involvement of one-third to one-half of the superficial surface of the body is likely to end fatally". (*See* Modi's *Medical Jurisprudence and Toxicology*, 17th Edn., p. 196).
>
> *"..... .In suppurative cases, death may occur after five or six weeks or even longer" (ibid. p 198).*
>
> Taylor says:—
>
> *That after the fourth day of injury, "the chief danger to life is the occurrence of sepsis in the burned areas".*
>
> (See Taylor's "*Principles and Practice of Medical Jurisprudence*", 12th Ed., Vol. I, p. 331)

It was contended for the appellant that death of Maya Devi was not the direct result of the injuries caused by the acid burns but was on account of some supervening circumstances not resulting from the injuries and therefore, the appellant could not be held guilty of murder. He relied on the evidence of Dr. (Miss) Nirmala Lakshmi Narain who had stated, on her cross-examination that the cause of death of Maya Devi was melaena and respiratory failure. Malaena, according to Dr. Jain is nothing but passing of old blood in the stools. The evidence of Dr. S.S Kaushal who performed the post-mortem examination of the dead body is definite. He says:

> *Death, in my opinion, was due to toxaemia and septisemia from absorption of toxins from extensive superficial ulceration of the body caused by some corrosive material.*

As already stated the evidence of Dr. Jain and Dr. Raj Kumar is also to the effect that the injuries caused on Maya Devi were sufficient in the ordinary course of nature to cause death. The fact that Maya Devi developed symptoms of malaena and respiratory failure and they also contributed to her death cannot in any way affect our conclusion that the injuries caused by the acid burns were the direct cause of her death.

Since Curling first drew attention to the occurrence of duodenal ulcers after burns numerous cases have been recorded both *in vivo* and post-mortem after burns. Petechiae of the stomach and duodenum, often with erosions, occasionally acute ulcers, is a more common post-mortem findings: The condition is due to anoxia from hypertension and stasis. The large bowel may also be involved" (See *Taylor's Principles and Practice of Medical Jurisprudence*, 12th Edn, vol I, p 331).

Modi, in his *Medical Jurisprudence*, has stated that burns would cause:

> *Inflammation of serious membranes and internal organs, such as, meningitis, peritonitis, oedema glottidis, pleurisy bronchitis, bronchopneumonia, pneumonia, enteritis and perforating ulcer of the duodenum (17th Ed., p. 197).*

11.12.13 Diminished Responsibility[35]

As indicated earlier, medical opinion gave no certain guide as to the cause of death. While death as the result of violence is not ruled out by that evidence it showed that cyanide poison might as well have been the cause. The learned judge, therefore, rightly held that the person who caused violence could not be held to be liable for anything more than causing hurt. The question as to whether that hurt was one which could be designated as 'grievous' naturally came up for discussion by the judge after fixing the offender. The doubt as to the cause of death was caused by the presence of traces of cyanide in the stomach contents detected by the chemical examiner. As to how those traces happened to be present is a mystery to all those who had something to do with the case and it will be futile to attempt to unravel it.

35. *Joseph Cheriyan v State of Travancore-Cochin*, AIR 1953 Trav-Co 129 : 1952 Ker LT 656 : 1953 Cr LJ 706 (TC).

CHAPTER 12

NARCOTICS

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Fig. 12.1

Cannabis Sativa L
1. Flowering Shoot 2/4. Male/Female inflorescence. 3. Male flower
5. Female flower 6. Fruit 7. Seed

12.1 INTRODUCTION

The word "Narcotic" has been derived from Greek word *Narkotikos* meaning a state of lethargy, sluggishness or sleep. However, Narcotic drugs convey a common meaning for all those drugs and substances, which induce an altered state of consciousness in an individual and have high abuse potential.

Narcotic drugs are addictive *drugs* that reduce the user's perception of pain and induce euphoria (a feeling of exaggerated and unrealistic well-being).

A drug, which has a deteriorative effect on the human mind and body, is called a narcotic or a narcotic drug. The outwardly effect may be just the opposite. The drug abuser may show signs of stimulation to start with. He may feel relieved of pain, fatigue or worry. It may make him more active but ultimately, the drug will deteriorate the body functioning.

Different types of drugs have different types of initial effects. For example, opioids sedate, stimulants stimulate and hallucinogens hallucinate. Thus, these drugs have different effects on the body and mind of the abuser, yet all of these are termed as narcotics in common parlance.

In law, narcotics are simply those drugs, which the government through the Narcotic Drugs and Psychotropic Substances Act, 1985 prohibits/controls/regulates their production/sale/purchase. The Act provides the legal framework to handle their menace. It is amended from time to time to keep it updated.

The names of the narcotic drugs are given in the Schs I and II, appended to the Act.

12.1.1 Medical Definitions of narcotics

1. A drug (such as codeine, methadone, or morphine) that in moderate doses dulls the senses, relieves pain and induces profound sleep but in excessive doses causes stupor, coma, or convulsions.
2. An agent that produces insensibility or stupor, applied especially to the opioids, i.e., to any natural or synthetic drug that has actions like those of morphine.

12.1.2 Legal Definitions

Narcotic Drugs and Psychotropic Substances Act, 1985 has not defined the term 'narcotic' in general terms. It has however defined various narcotic drugs and related terms in section 2. Relevant sub-sections, defining the various drugs read as under:

(iii) "cannabis (hemp)" means:

(a) *charas*, that is, separated resin in whatever form whether crude or purified obtained from cannabis plant and also include concentrated preparation and resin known as *Hashish* or Liquid *Hashish*;

(b) *ganja*, that is, the flowering/fruiting tops of the cannabis plant (excluding the seeds and leaves when not accompanied by the tops), by whatever name may be known as designated; and

(c) any mixture, with or without the neutral material of any of the above forms of cannabis or any drink prepared therefrom;

(v) "coca derivatives" means:

(a) crude cocaine, that is, any extract from the 'coca leaves' which can be used directly or indirectly for the manufacture of cocaine;

(b) ecgonine and all the derivatives from which it can be recovered;

(c) cocaine that is methyl ester of benzoyl ecgonine and its salts; and

(d) all preparations containing more than 0.1% of cocaine;

(vi) "coca leaf" means:

(a) the leaf of coca plant except a leaf from which all ecgonine, cocaine and any other ecgonine alkaloids have been removed;

(b) any mixture thereof with or without neutral material but does not include any preparation containing not more than 0.1% of cocaine;

(vii) "coca plant" means the plant of any species of the genus Erythroxylon;

(viia) "commercial quantity" in relation to narcotic drugs and psychotropic substances, means any quantity greater than the quantity specified by the Central Government by notification in the Official Gazette;

(viid) "controlled substances" means:

Any substance which the Central Government may, having regard to the available information as to the use in the production or manufacture of Narcotic Drug or psychotropic substances or to the provisions of any international convention by notification in the Official Gazette, declare to be a controlled substance.

(x) "manufacture", in relation to narcotic drugs or psychotropic substances includes—

(1) all processes other than production by which such drugs or substances may be obtained;

(2) refining of such drugs or substances;

(3) transformation of such drugs or substances; and

(4) making of preparation (otherwise than in a pharmacy on prescription) with or containing such drugs or substances;

(xi) "manufactured drug" means—

(a) All coca derivatives, medicinal cannabis, opium derivatives, and poppy straw concentrate;

(b) Any other narcotic substance or preparation which the Central Government may, having regard to the available information as to its nature or to a decision if any, under any International Convention, by notification in the Official Gazette declare to be a Manufactured Drug, but does not include any narcotic substance or preparation which the Central Government may, having regard to available information as to its nature or to a decision, if any, under any International Convention, by notification in the Official Gazette, declare not to be a manufactured drug;

(xii) "medicinal cannabis" that is medicinal hemp means any extract or tincture of cannabis (hemp).

(xiv) "Narcotic drug" means coca leafs, cannabis (hemp), opium and poppy straw and includes all manufactured drugs.

(xv) "Opium" means:

(a) The coagulated juice of opium poppy; and

(b) Any mixture with or without neutral material, of the coagulated juice of opium poppy,

but does not include any preparation containing not more than 0.2% of morphine.

(xvi) "Opium derivative" means:

(a) medicinal opium, that is opium which has undergone the process necessary to adapt it for the medicinal use in accordance with the requirements of the Indian Pharmacopoeia or any other pharmacopoeia notified in this behalf by the Central Government whether in powder form or granules or otherwise mixed with neutral material;

(b) prepared opium, that is, any product of opium obtained by any series of operations designed to transform opium into an extract suitable for smoking and the dross and other residue remaining after opium is smoked;

(c) phenanthrene alkaloids, namely, morphine, codeine, thebaine and their salts;

(d) diacetylmorphine, that is, alkaloid also known as diamorphine or heroin and its salts; and

(e) all preparations containing more than 0.2% morphine or containing any diacetylmorphine.

(xvii) "Opium poppy" means:

(a) The plant of the species *Papaver somniferum.*

(b) The plant of any other species of *papaver* and from which opium or any phenanthrene alkaloid can be extracted and which the Central Government may by notification in the Official Gazette, declare to be opium poppy for the purpose of this Act.

(xviii) "Poppy straw" means all parts (except seeds) of the opium poppy after harvesting, whether in their original form or cut, crushed or powdered and whether or not juice has been extracted therefrom.

(xix) "Poppy straw concentrate" means the material arising when poppy straw has entered into a process for the concentration of its alkaloids.

(xx) "preparation", in relation to narcotic drug or psychotropic substance, means any one or more such drugs or substances in dosage form or any solution or mixture, in physical state, containing one or more such drugs or substances;

(xxii) "production" means the separation of opium, coca leaves or cannabis from the plants from which they are obtained:

(xxiii) 'Psychotropic substance' means any substance, natural or synthetic or any natural material or any salt or preparation of such substance or material included in the list of **Psychotropic substance** specified in the schedule.

(xxiiia) "small quantity" in relation to narcotic drugs and psychotropic substances, means any quantity lesser than the quantity specified by the Central Government by notification in the Official Gazette;

12.1.3 Deterrents

Narcotics have acquired tremendous notoriety in recent years. Human nature often wants to run away from reality. Formerly, religion provided the vent. The success or failure was all attributed to God. With the change to materialism, the very existence of God is questioned.

> **'If there is no God, let us create one'**
>
> **Voltaire**

The escapist, the person who wants to escape from reality, finds refuge in drugs. Their abuse is increasing at a frightening rate among all sections of society. The greatest menace of the invasion is among the youth. If they become lotus-eaters, the nations will go down. Each nation, therefore, views the abuse of drugs with concern and provides stringent measures against the same. The person who contravenes laws in relation to production, manufacture, possession, sale, purchase, transport, storage, import, export or uses it himself, is punished with rigorous imprisonment and/or a heavy fine of Rs 1-2 lakhs in respect of the following items:

1. poppy straw;
2. cocoa plant and leaves;
3. prepared opium and opium;
4. embezzlement of opium by its cultivators;
5. cannabis (hemp) *Charas*/*Hashish* (Punishment for *Ganja* is rigorous imprisonment up to 5 years and a fine up to Rs 50,000);
6. manufactured drugs; and
7. psychotropic substances.

Even attempts to commit any of the offences relating to the above drugs and psychotropic substances carry the same punishments. Recidivism invites enhanced punishments, 50% enhancements for most of the offences. Amendments tend to reduce the quantum of punishment.

There is a general belief that the drugs provide the criminal with the courage to commit crime. This does not appear to be so in most of cases. The physiological action of the narcotics on the human body is mostly not conducive for the commission of crimes. However, drug addiction does provide a strong motive for the crime.

1. The drug addict needs the drug, which he can get mostly from illegal sources, as narcotic drugs are banned.
2. The drug addict needs money for the purchase, which in most of the cases, is obtained by illegal means: theft, bribery, embezzlement, robbery, forgery, cheating, extortion, abduction, prostitution, drug peddling.

Certain narcotics do inhibit the power of discrimination and judgment. The baser tendencies of the criminal come out, which promote the commission of a crime. For example, alcohol and cannabis make a person insensitive and he may commit a crime, which he would not commit if he were not under the influence of the drug. It is believed that these drugs may promote criminal activities, especially in those who have inherent criminal tendencies that had been dormant due to social influence.

Some of the drugs like LSD and PCP give hallucinations to the addict and he loses sense or judgment of time, of space and of human values. He commits crime conforming to the general perception that drugs promoting the crime.

A 19 years-old boy was apprehended, while completely nude, in an apparent burglary-rape attempt. He was found under the influence of LSD. The boy revealed that after taking LSD he felt a strong urge to commit rape. He drove in his vehicle for about a kilometre when he observed light in a house. He disrobed in the car and went to the house and attacked the girl. He failed to do any damage, as the girl was able to get help of her neighbour through telephone. The boy mentioned that he has taken LSD previously also and felt the same desire and entered at least three houses. He did not remember what he did on those occasions. (CH)

12.2 ADDICTION

12.2.1 Nature

Psychologically drug addiction is a state of mind and body in which a person has lost self-control depending on the drug to which he is addicted. He consumes the drug repeatedly without caring about social/cultural/humane values. A drug addict will resort to any crime to satisfy his repetitive craving for the drug.

Medically, addiction is a mental disease. The main feature of the disease is that the victim wants to take the drug repeatedly, knowing fully that the drug is harmful. However, the physiological (mental) urge is so strong that the victim is not able to control/resist the urge to take the drug. Addiction due to its repeated intake becomes a biological necessity. Unfortunately, most of the addicts deceive themselves that the drug is inherently useful, desirable, and pleasurable.

The effects of addiction are mainly deteriorative personality changes. They include insomnia, instability, and lack of self-confidence, especially when not under the influence of the drug. The addict cannot concentrate on any work. He avoids social contacts. Slowly, he becomes a mental, physical and moral wreck and a burden to the society.

12.2.2 Signs/Symptoms of Addiction

One or more of the following signs/symptoms indicate drug addiction:

1. Uncontrollable Craving: the addict feels an overpowering craving to take the drug repeatedly and tries to procure the same by any means.

2. Psychological Dependence: the drug addict feels that he cannot do without the drug. Consequently, if he does not take the drug his mental processes are affected. He is unable to concentrate on his work and cannot carry out his work efficiently. Psychological syndromes appear in the form of restlessness, uneasiness, anxiety, panic, aggressive behaviour, depression, delirium and suicidal tendencies.

3. Physical Dependence: certain drugs like morphine, when taken repeatedly by a person, can alter his physiological body functions. The drug becomes part of the physiology. The body becomes sick, inactive and incapable of carrying out any useful activity in the absence of the drug. Such dependence on drug is called *physical dependence*. In acute cases withdrawal of the drug causes serious physical and mental illness-also called withdrawal or abstinence syndrome. Physiological syndromes appear in the form of nausea, vomiting, sweating, pain in the abdomen, muscular cramps, convulsions, and sometimes even in death.

4. Tolerance: when a drug is taken repeatedly, the body becomes used to the drug. It needs increasing amounts of the drug to have the same effect. This tendency of the body, to require increasing amounts of drug for corresponding intoxication, is called tolerance developed by the body. It has also been defined as *body-tolerance* to a drug when the same amount of the drug causes less and less intoxication effect on the body.

In fact, the distinction between habit-forming drugs and addictive drugs is not well defined. Some persons base it on tolerance. The habit-forming drugs (tea, coffee, cigarette or even cannabis) do not develop tolerance. Addictive drugs (opioids) develop tolerance. The habit-forming drugs usually do not produce most of the detrimental effects on the individual on withdrawal, though drug deprivation affect psychologically and he/she is not able to function normally. Addictive drugs, however, develop withdrawal syndrome.

12.2.3 Causes of Drug Addiction

Drug addiction is habituation to consume drugs (usually contraband drugs). The addicts take them for any of the reasons, real or imagined, given below:

1. Reduce tension
2. Relieve fatigue
3. Reduce pain
4. Improve feeling of well-being
5. Stimulate body
6. Reduce sleep
7. Facilitate social contact
8. Enrich sexual experience
9. Curiosity
10. Revolt against old values
11. Fashion

Medical practitioners do not prescribe narcotics as medicines.

The familial/social reasons for taking drugs are:

1. Broken families
2. Wrong company
3. Ambitious families
4. Defective weak personality
5. Double standards by parents: one for themselves and one for the youngsters
6. Low education
7. Unearned money
8. Over indulgence in money expenditure
9. Emotional upset
10. Failure/frustration

12.3 THE ADDICT

Only those persons become addicts who have flawed personalities. They cannot face the competition from their colleagues. They run away from the world of reality to that of the world of make-belief happiness, achieved through drugs. The drugs provide them temporary shelter from life's hardship and failures. But the relief from the shelter is short-lived. He has to acquire the drug repeatedly. It needs money, more money, still more money. His legal resources are soon exhausted. He enters the world of crime losing all self-respect, decency, society and even family.

An addict is an unpleasant sight. He is tormented by the ever-impending need and insatiable desire for drug, which ultimately takes his life prematurely. Yet it is difficult to sympathise with him. He is himself responsible for the wreckage. He has himself renounced the normal world. Or is it nature/nurture which has brought the calamity?

The addict, ordinarily, starts taking the drug as an experiment with the drug, to start with. He believes he cannot become an addict. Therefore, experimentation cannot harm him. The first experience of addiction-prone person is usually euphoria, which inculcates the desire to experiment a second time, third time and so on. Initially the interval between the intakes is long but it gradually shortens and ultimately it comes to an addiction stage, where the requirement he needs the drug at regular intervals and cannot resist its intake.

The dose of the drug also increases with the passage of time. Consequently, the cost of being in the twilight zone also increases and upsets the addict financially and ultimately socially. In order to get the maximum advantage of the drug, he injects the drug in the blood stream and thus becomes **main liner**.

12.3.1 Identification of the Addict

The following evidence identifies the addict:

1. Presence of drug on the person/ in his (her) baggage/ vehicles/ book/residence; he often hides the drug at the dirtiest places like a lavatory.
2. Presence of drug ingestion paraphernalia: equipment for smoking/drinking/ injection on his person/his premises.
3. Presence of needle pricks.
4. Scars on the body caused by older needle pricks. Sometimes the scars at sites are covered with tattoo marks. Needle pricks also create tattoo marks. If the needle or the cotton filter used is dirty, it also deposits the dirt under the skin.
5. Presence of abscess, ulceration, scab and pinkish swelling over the injection sites.
6. Presence of drug in the body.
7. Drug intoxication in the absence of alcoholic smell; It is indicated by:
    - Contraction of the pupils in opiate addicts. The contraction is substantial (3 mm from 6 mm). The movement of the eyelid is also sluggish.
    - Dilation of the pupils of those who have taken stimulants, which dilate pupils.
    - Unsteady gate.
    - Incoherent slurred speech.
    - Loose mental processes.
    - Vacant look
    - Drowsiness, droopy eyes
    - The tendency to laugh (or weep) at trivials
    - Dry mouth
    - Pale skin
    - Pale brittle nails
8. Cyanosis
    - Slow breathing
    - Reduced urination
    - Low blood pressure

- Anoxia
- Voice changes
- Slow heart beats

9. Changes in behaviour
   - Moody
   - Drug culture
   - The vocabulary of the drug addicts
   - Absence from school or college
   - Powdery contents on the person, from cigarette stubs
   - Remains alone in a room or bathroom for long intervals of time
   - Rushes to bathroom or go outdoors in the morning.
10. Nalline test indicates the opiate addicts. The test is carried out as under:

    A small dose (3 mg) of Nalline is injected into the body of the suspect. The size of the pupil of the suspect is measured before and after the injection. An addict will show appreciable dilation of the pupil. The drug has practically no effect on non-addicts.

    Nalline in this dose does not produce withdrawal syndrome.
11. Urine test. The drugs are often eliminated through urine wholly or partially. A chemical test, therefore, reveals the drug.
12. The individual changes his work mode.
13. Drug addiction changes an honest and decent person into a cheat, a forger, a thief, a pimp or a prostitute. They are his associates now.
14. Withdrawal symptoms, when kept away from drug.
15. The visible apparent addict pointers are:
    - Long-sleeved shirt, to hide needle marks
    - Dark glasses, to hide mitosis (eye contraction)
    - Flushed face, shifting eyes
    - Dry mouth, thirst, craving for sweets
    - Rickety body, pale skin
    - Mental confusion, slow reflexes
    - Disorderly

The majority of the addicts show the above *portrait parle*. There are exceptions. The rich addict may hide his addiction with money.

12.3.2 Withdrawal Syndrome

The addict becomes nervous and restless when the effect of the drug wears off. He starts sweating. His nose and eyes start running, and continue doing so increasingly for a long time. Twitching of skin, dilation of pupils and recurring goose flesh is observed next. It is followed by vomiting, diarrhoea, loss of appetite and sleep. Respiration, blood pressure and body temperature also changes. The withdrawal syndrome is acute for several days, after which the trouble starts subsiding. Complete recovery may take three to six months, or even more time.

The withdrawal syndrome can be roughly put into the following stages:

12.3.2.1 Stage I (8–24 hours)

This stage is mostly governed by fear psychosis of the non-availability of the drug. Nothing happens for the first 8 hours or until the next dose time; except that the subject feels discomfort and fears the onslaught of the abstinence.

The next 8 hours, is the restlessness time:

- Body perspires.
- Nose and eyes runs.
- Yawning, sneezing and other common cold symptoms appear.

In the next 8 hours the addict suffers:

- Loss of appetite
- Body shivering
- Cold turkey flesh (recurring goose flesh) appears

He is in trouble.

Stage II (24 – 48 hours)

This stage heralds real troubles: insomnia, diarrhoea, vomiting, weakness and depression. It continues for a day.

Stage III (48 – 72 hours)

Stage II symptoms intensify and reach the peak. Cramps and twitching increases manifold.

Stage IV

After about three days, the symptoms start subsiding but nervousness and insomnia continue for months together, in some cases. Net result is: weight loss, personality loss, physical dependence is finished. However, the psychological dependence continues. It can lead the addict to relapse, if proper supervision is not exercised.

12.4 NARCOTICS AND CRIMES

12.4.1 Non-violent Crimes

Drug addiction involves a large variety of criminal activities. In fact, a drug addict, as he takes illegal drugs, is a criminal. He continues to indulge in criminal activity. He cannot continue as drug addict otherwise, ordinarily. The habit causes him to lose his job, alienate his family, destroys his health and character. He is left with one craving: drug consumption! For its procurement, he adopts all sorts of criminal activities if he has no legitimate financial resources.

1. The addict steals money from home, from friends and from strangers, from everyone.
2. He acts as a prostitute or pimp.
3. He becomes a police informer.
4. He commits forgery.
5. He embezzles money.

6. He sells drugs. He becomes a drug peddler.
7. He blackmails and extorts.
8. He smuggles drugs, arms and explosives.
9. He manufactures illicit drugs.
10. He joins crime syndicates.
11. He induces others to take drugs.

12.4.2 Violent Crimes

Drug intake, ordinarily, does not appear to induce criminality. However, certain drugs reduce social inhibitions. They bring to surface the inherent criminality of the individual, which had been dormant due to education/family/societal pressures. Drugs open up the individual. Liquor and cannabis are some such drugs. Hallucinogens can lead to violent crimes. With such drugs, the addict loses the sense of time, space and of human values and commits the crime without understanding or bothering about the consequences of crimes.

Stimulants, like cocaine and amphetamines, invigorate the physiological activities. They can certainly promote violent crimes, mainly in those persons who have inherent criminality in them.

Opioids, barbiturates and other tranquilizers, generally, tend to inhibit tendencies towards violent crime. In fact, these drugs decrease violent crime.

Drugs induced criminality is conditioned by other factors also. The personality of the drug addict, the surroundings, the nature and the frequency of intake of the abused drugs are important determinants.

12.4.3 Drug Problem in India

The main drug-related problems in India include:

1. Wild growth/cultivation of cannabis.[1]
2. Cultivation of poppy plant.
3. Growth of addiction/drug abuse.
4. India is sand-witched between Golden Triangle and Golden Crescent. The countries produce large amounts of opium and its derivatives and use India as a conduit/route for smuggling out the opiates. Punjab and the six sister states in the East are badly affected.
5. The *charas* from Nepal is smuggled out through India. Even the Pakistan *charas* smugglers use Indian route to smuggle out the drug to western countries.
6. Narco-terrorism.

12.5 COMMON NARCOTICS

The common narcotics used in India and elsewhere are:

1. Cannabis
2. Opioids
3. Cocaine

1. There is a relatively recent thinking (via research) that cannabis cultivation should be allowed for its great medical potential.

4. Amphetamines
5. Methamphetamine
6. LSD
7. PCP (Phencyclidine, also known as Angel Dust, Rocket Fuel)
8. DMT (N-dimethyltryptamine)
9. Solvents
10. Designer's drugs (waiting to invade India on a mass scale)

Alcoholic drinks are also narcotics. However, they are perhaps mild and universal. Common person perhaps does not know that they are narcotics. Besides, governments have not put alcoholic drinks on the list of narcotics.

Most commonly abused narcotics are cannabis and opioids.

Cannabis grows wildly in all parts of India. It is also cultivated in some parts of the country. Originally, the cultivation was done for its fibres and seeds but now the cultivation is done more for narcotic entities: *Charas, Ganja, and Bhang* than for the traditional items.

Charas of Kullu valley of Himachal Pradesh is rated very high in quality. It is being smuggled out of the country.

Cultivation of poppy plant (*Papaver Somniferum*) is done, under Government control, in some parts of India (Utter Pradesh, Madhya Pradesh and Rajasthan). Part of the produce goes to the illegal market, where morphine is extracted from the opium and converted into **heroin**. Heroin is the real top heroine in the drug world.

Some of the opium or morphine released by the Government to authorised dealers for legal use also goes to the illegal market. However, the quantity of the drug in the illegal market is limited.

Illegal cultivation of the poppy plants is also prevalent in some secluded parts of the country.

The major producers of heroin in the world are the countries, which fall in the territories nicknamed as the Golden Crescent and the Golden Triangle. The former includes Pakistan, Afghanistan and Iran. The Golden Triangle includes Myanmar, Thailand and Laos. India has long borders, parts of which are highly inhospitable. The smugglers, however, utilise them to their advantage for smuggling heroin. Not only India acts as the pipeline for the drug smugglers but a fair part of the drug also trickles out on the route. The people of some of these border states use the drug to become drug addicts. The worst affected states are Punjab and Manipur where it is believed that 20% of the population has become a drug addict. Punjab has gone even worse. A recent guess is that about 50% of the population takes drugs. Perhaps it is due to being sandwiched and the route effect!

In addition to the cultivation, manufacture, trade and smuggling of drugs, which are serious problems in themselves, the sharply rising incidences of addiction have intensified the drug problem manifold.

Narco-terrorism is being used to finance terrorist activity. It has further promoted the terrorist activities in recent years in India. The terrorists need money for their activities. They smuggle and trade in narcotics and use the money to promote terrorism.

12.6 CLASSIFICATION

Narcotic drugs are divided into three main categories:

1. Sedatives
2. Stimulants
3. Hallucinogens

12.6.1 Sedatives

Sedative drugs have a depressant effect upon the body and make it less sensitive to pain/worry/emotions. They relieve the drug user from their evil effects. Examples of common and potent sedatives are: Opium, Morphine, Heroin, Codeine, Demerol, Methadone,

12.6.2 Effects

The opioids depress certain parts and stimulate (in neuro-physiological sense) other parts of the nervous system. The central nervous system is affected. The main manifestations of the effect are:

1. Reduce metabolic rate,
2. Lower blood pressure,
3. slow down respiration,
4. reduce hunger,
5. cause weight loss, overtime,
6. reduce sexual desire/activity in both males and females,
7. induce euphoria in addiction-prone individuals who derive pleasure from the drug. The degree of pleasure sensation depends upon the individual, the extent of his neurotic or psycho pathetic condition. It may be maximum when the individual is a beginner. This sensation weakens with the passage of time,
8. induces nauseating experience to a stable personality,
9. cause sickness in those persons who are allergic to opioids. Some even die.

Physiological and psychological effects vary somewhat with the varied techniques of administration.

12.6.3 Drug Dependence

Opioids create drug dependence, which has the following elements:

1. **Psychological Dependence:** the addict develops psychological dependence: He craves to take the drug repeatedly at the interval.
2. **Tolerance:** the body gets used to the drug and the subject needs an increasing dose to have the equivalent effect. The phenomenon is called “Drug Tolerance”.
3. **Physical Dependence:** body physiology changes. It needs the drug to ward off certain physiological problems. If the addict does not take the drug, he suffers from withdrawal syndrome and is unable to act and behave normally.

12.6.4 Non-Opiate Opioids

Barbiturates are another important group of substances (which are increasingly being used sedatives. They are also being used as drugs of addiction.

Barbiturates are important in medicine as sedatives and analgesics in cases of a nervous breakdown, emotional upsets and in certain ailments (asthma, insomnia, menstrual irregularities) especially along with other medicines. They do not leave any undesirable effects in medicinal doses.

Barbiturates, if taken in excess, produce intoxication, often with severe withdrawal syndromes. The alcoholic or opiate addicts often take barbiturates when they do not get alcohol or opiates. They also enhance or modify the effects of certain drugs of addiction. For example, emotional tension developed by cocaine or amphetamine addicts is controlled, with barbiturates. Likewise, intoxication of alcohol is prolonged if a barbiturate is taken along with.

Drug addiction of barbiturates has the following features:

1. The addict has the tendency to increase the dose, overtime
2. The addict suffers from withdrawal syndrome when he is not under its influence (not intoxicated).
3. The addict develops psychological dependence, characterised by a strong desire to take the drug repeatedly.
4. Barbiturate withdrawal syndrome is characterised by anxiety, twitching of muscles, tremors in hands and fingers, weakness, giddiness, nausea, vomiting, insomnia, lowering of blood pressure and delirium.
5. The symptoms start appearing in about a day and are intense for about three days. They slowly subside in about 10 days.

12.6.5 Miscellaneous

Other important non-opiate sedative drugs (opioids) are chloral hydrate (knockout drops) paraldehyde and bromides.

Tranquilisers (non-opiate non-barbiturates) have also invaded the field. They develop drug addiction similar to those of barbiturates.

12.6.6 Stimulants

The stimulant drugs stimulate various body functions. The important stimulants are:

1. Cocaine: snorted/smoked/injected
2. Amphetamines: swallowed/snorted/smoked/injected
3. Methamphetamine: swallowed/snorted/smoked/injected

They are used/misused to:

1. Counteract the effect of sedatives.
2. Keep awake during examination days or on long and night drives.
3. Pep up, to face the world better.

Addiction follows the usual pattern. Necessity or curiosity leads to experimentation. Frequency of desire to take the trip increases with the passage of time until the person becomes a slave to the drug, *i.e.*, an addict. Cocaine/Amphetamines affect the central nervous system. Usually, the person has the feeling of euphoria, well-being, increased self-confidence, heightening of alertness and initiative.

12.6.7 Hallucinogens

Hallucinogens are drugs, which affect the mental process of the human being, especially his perception, consciousness and his understanding. They are also known as psychedelic or psychotomimetic drugs.

Human beings have been taking hallucinogens from early times. They were taken by the mystics and the recluse who thought the drugs would enable them to detach themselves from the world and establish a union with the divine power.

To start with, hallucinogens were of plant origin. For example, peyote is a small cactus. It contains mescaline, which is a hallucinogen. *Charas* (a pseudo hallucinogen) is obtained from cannabis (*Bhang*). Lysergic acid, the starting material required to prepare LSD, was obtained from a fungus growth on rye grains.

Synthetic hallucinogens have ultimately come up replacing the original sources. For example:

1. LSD is now obtained from a synthetic source.
2. PCP (Phencyclidine, also known as Angel Dust, Rocket Fuel) and
3. DMT (N-dimethyltryptamine).

The synthetic drugs are similar in properties and their effects on LSD. Mescaline, the important alkaloid of the peyote cactus, can also now be prepared synthetically.

Hallucinogens are usually non-addictive. That is, these drugs do not induce drug dependence or drug tolerance, nor do they cause withdrawal syndrome. However, with these drugs, especially with LSD, the personality changes are so drastic that they are far more dangerous to society than even the addictive drugs.

Medical researchers are using these drugs for research purposes for mental ailments, and for exploring the hidden world of mental processes and feelings.

12.6.8 Solvents

New classes of substances, which are not included in the drug schedules, are solvents. The younger generations are taking up to their sniffing increasingly. The solvents being sniffed are:

1. Petrol
2. Paint Thinners
3. Others

All these materials are easily available. The solvent is poured on a handkerchief or taken in a plastic pouch and sniffed. They create the desired intoxication in the body of the sniffer.

The solvents are a serious menace to the health of the sniffers. They affect the windpipe, the lungs and the liver and are precursors to many ailments. They damage larynx; the air passage may be choked to cause suffocation.

12.6.9 Synthetic Narcotics

New synthetic drugs like Pethidine, methadone, LAAM, propoxyphene and buprenorphine have invaded the drug addicts' world and gradually drug menace. They possess better pain killing properties or have a long-lasting effect. For example, the Methadone effect lasts for about 24 hours.

12.6.10 Designer Drugs

Drug trade is highly lucrative. Alternative drugs to the prohibited drugs under the Act are being designed to evade the law, enhance potency and produce drugs which keep the addict intoxicated for longer duration.

Analogs of already existing drugs are called as designer drugs prepared. Analogues are the drugs, which have similar electronic structures but can have different molecular formulae. Many analogs of controlled drugs have entered the market of the illicit drug trade, which is a thousand times more potent than the traditional drugs.

Fentanyl (also known as fentanil) is an addictive drug with effects similar to morphine. However, it is about 100 times more potent than morphine. It is a synthetic drug and possesses a typical structure. Minor modifications in the molecule can produce numerous analogs, of which some are many times more potent than the fentanyl. For example, 3-Methylfentanyl is highly potent narcotic analgesic, its one gram can produce one million doses. Further, one gram of Carfentanil can produce 1.2 million doses, which is 10000 times more potent than morphine.

Another narcotic synthetic drug is Pethidine. Its major analog is MPPP, which is about 25 times more potent than Pethidine.

Among the stimulants, cocaine is starting material to prepare better stimulants. Two compounds, 2-Carbomethoxy-3 (4-fluorophenyl) tropane and 2-Carbomethoxy-3-Phenyln-ortropane are 60 times more potent than Cocaine.

A concoction of Fentanyl mixed with Halothane was supposed to have been used by Russia to control terrorists holding about 1000 hostages including theatre artists in a Moscow theatre. (CH)

12.7 EVIDENTIARY CLUES

Abuse of narcotic drugs is a serious world problem. It is increasing in all countries. The law enforcement agencies are, therefore, worried increasingly to control, contain and investigate drug-abuse crimes. Ordinarily, the following sources provide evidentiary clues in drug-abuse crimes:

1. The addict
2. The crime scene
3. The clandestine laboratories
4. The distributer
5. The peddler
6. The drug joints

The evidence relating to drug addiction include the drug addict, the drug, the containers of the drug, smoking paraphernalia, the syringe or the improvised injection devices, utensils used to heat, dissolve and modify drugs, are the clues found with the drug addicts. Needle prick scars, urine, blood, stomach wash, perspiration and hair are other useful clues. Manufacturing paraphernalia, associative chemicals, solvents, heating and distillation devices are met with at drug manufacturing sites. Special cavities, secret chambers and modified recesses in transport vehicles, where the drug on a bulk scale is stored are found on transport vehicles.

In a case of drug smuggling, the drug was carried in the belly of a camel. The belly of the camel had been opened and heroin in a plastic pouch was placed in the belly. Then the wound was stitched. (CH)

The following are the main sources of evidentiary clues:

12.7.1 Drug Addict

The addict is the most important source of clue materials. If he has consumed a drug, his blood, urine, hair, stomach-wash or stomach contents will have the drug.

If he injects the drug regularly, he creates needle marks on his body. The injection marks would be on the hands, arms, feet or legs. If the drug is injected subcutaneously, the marks will be seen on buttocks, thighs, legs or upper parts of the arms.

The drug may be found on his person. Cigarettes, smelling salt, handkerchiefs and purse are possible carriers. They are taken into possession. Any medicine, sweetmeats and smoking paraphernalia (pipe, tobacco, pouch, cigarette lighter) should receive thorough scrutiny.

Gum, glues, adhesives, books, notebooks, pen and pencils are checked for concealed drugs. Powder, cream and other cosmetic items are given a thorough check for drugs.

12.7.2 Addict's Residence

Residence of an addict usually yields a rich harvest of evidentiary clues. If the drug addict is living with his family, he is likely to hide the drug at secret places. The hiding place may be in the lavatory, bathroom discarded store, garage or vehicle. The usual clues are:

1. **The drugs;** open or concealed, pure or mixed
2. **The intake paraphernalia;** to consume the drug, if the drug is smoked, smoking pipe, will be located. If the addict is the main liner, injection needle – clinical or improvised, will be found. If the drug is 'cooked', heated or boiled, separate utensils will be found for the purpose.
3. **The drug residuals;** may be found at the site. These may be the packing material. These may be bottles or other containers. These may be even residues of smoked items. Or, the residual drug sticking to its receptacle may be found.
4. **Modification equipment;** if the addict prepares or modifies the product, equipment for such modification are found at site.
5. **Hiding sites;** arrangement for hiding the drug such as secret chambers/almirahs/boxes are found in some cases; especially where the drug consumption is organised on a commercial scale at the site. That is, if it is a drug den.

12.7.3 Clandestine Laboratories

In drug world, clandestine laboratories are places where narcotic drugs are prepared secretly, with improvised materials/tools/techniques. They usually manufacture popular narcotic drugs like, PCP, heroin, methamphetamine or extract/purify narcotic drugs of plant origin, all potent illegal drugs.

The drug mafia owns these laboratories most of the times. They locate the laboratories at a place away from the public gaze.

The handling of these laboratories needs knowledge of the drugs. Usually forensic experts are associated in the process to avoid accidents.

12.7.4 Drug Distributor/Peddler

Drug trade is a highly organised crime. Aeroplane, ships, cars (with special secret chambers) have been used for transport of the drugs. There are specified drug distributors/peddlers, who are usually drug addict s and they have joined the 'trade' to meet the cost of the drug they consume.

Quack doctors or drug peddlers retail narcotic drug. Their thievish/furtive/surreptitious behaviour indicates them. The drug they carry on their person or in their paraphernalia identifies them.

12.7.5 Drug Joints

Fig. 12.2

Cannabis cigarettes are often smoked by youngsters

Drug joint is usually a dirty/cheap/disreputable place of entertainment, usually a nightclub or restaurant where narcotic drugs are purchased/consumed by addict clients, often in company with other addicts. The youths often hold rave parties at these places. The drug joint owners locate the secret places (like underground secret rooms!). They often continue their clandestine activities for long periods, usually with the connivance of the local police. They are exposed when some serious crime occurs at the joint. Sting operation or surveillance also reveals them.

12.7.6 Collection of Evidentiary clues

In the collection of the evidentiary clues, the investigating officer must observe the following precautions, in addition to the usual ones:

1. Examine a suspected site for the manufacture or modification of the drug along with an expert from a Forensic Science Laboratory.
2. Do not smell, taste or smoke any substance suspected to be a drug.
3. Handling, packing and forwarding of chemicals need special care. Get the advice/help of the expert whenever possible.
4. Never depend upon the field tests alone. The suspected drug must be identified by a qualified person.

12.8 DRUG PROBLEMS/POSSIBILITIES

Drug addiction, as already seen, is a serious international problem for the law enforcing agencies including a forensic science laboratory, of all countries. The important questions raised by the problem include:

1. Is the suspect recovered material a narcotic or not? If it is, what is it? To establish the identity of the suspect material as a particular drug is the most important problem.

2. Has the suspect ingested/injected/taken a narcotic drug? if so, what is it? Search of the narcotic in urine/blood/stomach wash indicates the identity of the drug. Analytical techniques permit quantitation of the drug. If no drug is not found in body of the suspect subject, he is not subjected to additional investigations.

   The determinations of the dose also help the delivery of real justice in cases in which diminished responsibility is claimed for a serious criminal act under the plea that it happened under the influence of the drug.

   Further, a life insurance company may like to check whether a person is a drug addict or not before issuing insurance coverage. A will executed by a person is contested on the plea that the individual was under the influence of the drug. In some cases of alleged suicide, the actual cause may be drug addiction. In cases of sudden deaths, the real cause may be an overdose of a narcotic drug or a dose of an impure drug. The determination provides the correct picture.
3. Is the drug in question pure/diluted/impure/fake substitute?
4. Is the questioned drug licit or licit sources? Forensic analysis can give correct answers in most of the cases.
5. Where has the drug come from? The place of origin/laboratory where it was produced can be given with fair certainty. The question often acquires importance. The determinations can indicate if:
   - The drug is local or smuggled from outside.
   - In the latter case, it is possible to determine the country of origin. This helps to prevent smuggling of the drug into the country.
6. A witness in a criminal trial may be a drug addict. Naturally, his credit will thus be seriously affected. He may like to clear himself; or, the court may like to check in cases where it is challenged. A forensic analysis can establish addiction or otherwise of the individual.

12.9 SEDATIVES

12.9.1 Opium and Opium Derivatives

Fig. 12.3

Proud farmer of opium with opium plant flower and pods

All old civilisations were opium users. They used it both as medicine and for pleasure. In India, it was known much before the advent of Christianity in India, known at least seven centuries BC. It is believed that its use had spread from India to China and then to other countries like Egypt, Persia, Syria and later to Europe and then to America.

The scientific study, however, started only in the 19th century. The British were the first to isolate morphine from opium. The drug was used for de-addiction of opium. However, it was discovered soon that morphine was more potent as a drug of addiction than opium itself.

Opium was used extensively in India as a medicine and in religious ceremonies especially on the birth of a child. It still forms parts of its pharmacopoeia. However, the abuse of the drug caught up and continued to increase. Today heroin, a product based on morphine, is No. 1 narcotic in the world, embracing and destroying many a young person with its charms.

Opium to morphine, to heroin (diacetylmorphine), was a natural development. Like morphine, heroin was also believed to be a drug for de-addiction. In fact, it was marketed so in the initial stages by a German firm. Unfortunately, the results belied the hopes and it has proved a far greater danger — in fact, the most dangerous addictive and the most abused drug today.

The era of synthetic narcotic drugs started in the 20th century (1920–1940) and today it has reached the zenith (Or has it?). Yet there is no stopping. New drugs and the drug abuse continue spreading like a wildfire, the USA being the leader in its abuse in the world. Heroin menace rules the world, though it is a banned drug – no legal manufacture is allowed anywhere. The clandestine factories continue to churn out the drug in ever-increasing amounts to meet the ever-increasing demand.

Heroin production is morphine/opium based. The menace could be controlled if the production of opium is controlled/stopped. However, its three alkaloids, morphine, codeine and thebaine, have great medicinal value and legal production of opium continues. The part of the production of opium goes to the illicit market, where it ends up in the production of heroin.

Morphine is an extremely important drug used extensively the world over to relieve pain, control diarrhoea, reduce anxiety and to depress heart functions in heart problems. It is usually administered through injection.

Opium — morphine — Heroin are obtained from a poppy plant known *papaver somniferum,* which grows practically in all parts of the world, in all climates and regions, from the tip of South Africa to Moscow and from the Far East to the USA. However, notorious places for its production are:

- Golden Triangle: (Myanmar, Thailand, and Laos)
- Golden Crescent: (Iran, Afghanistan, Pakistan)
- Mexico
- Egypt and Turkey

The plant grows to a height of above 1 metre. It gives beautiful flowers, colours ranging from white to purple, mainly red and orange. Its fruit is the source of opium. When the petals fall off, the fruit grows to give opium fruit. The harvester gives an incision to the pod's skin. White milky fluid-like latex oozes out. On drying, it becomes gum-like material, which the harvester collects. The yield of opium is about five kg/acre.

There are many alkaloids in opium but the most important one is Morphine. It is separated from dissolved opium in water by adding lime followed by ammonium chloride. White powdery material appears on the surface, which is separated from the solution by filtration. The powder is converted into small bricks/blocks, usually of 250 /500 grams.

The Government of India has made stringent legal provisions to control and regulate the production, processing and sale of opium and its constituents/products. Narcotic Drugs and

Psychotropic Substances Act, 1985 and the Narcotic Drugs and Psychotropic Substances Rules, 1985, specifies for the purpose. The salient features of the same are:

- All cultivation of opium will be for the Central Government in specified areas only.
- The cultivation, collection of opium from the plants will be under strict supervision.
- The opium produced will be sold to Central Government authorities only.
- The Central Government will fix/pay a fair price to the cultivators.
- The Central Government would classify the quality of the opium for payment.
- The central Government views adulteration very seriously and inflict severe punishments.
- The Central Government alone does the manufacture/purification of opium in its opium laboratories.
- The Central Government deals alone with import/export/sale of opium.
- The State Government will, however, have the authority to regulate the manufacture, sale, purchase of medicinal opium and its constituents in the mixture form.
- Price of the various products will be fixed by the Central Government.

12.9.2 Opium

Opium is a mixture of about 35 alkaloids, the most important out of them being morphine. Opium contains about 10% morphine. Other important alkaloids are Narcotine, Codeine, Papaverine and Thebaine in order of decreasing percentage.

Table 12.1

Important Alkaloids of Opium

Morphine	9.5 to 14.2%
Narcotine	3.9 to 7.6%
Codeine	1.8 to 4%
Papaverin	1%
Thebaine	0.5 to 1%

Opium has been used as a drug, for its narcotic effects, for centuries, all over the world. Most governments have tried to limit its use for medicinal purposes only. However, illegal trade for the narcotic drug continues to flourish in most parts of the world. Opium is smoked, eaten or drunk. Its abuse through the hypodermic needle is dangerous.

Opium is a drug of addiction. Addiction-prone individuals feel great pleasure, when introduced to the drug. An intense desire to repeat the sensation is born after each dose until the individual becomes an addict. This phenomenon is accompanied by the need of ever-increasing dose (develops tolerance) and the increased frequency of intake. He reaches a stage when he cannot function without the drug (acquires dependence). If he does not take the drug, the body develops withdrawal syndrome. Ultimately, the addict is mental, physical and social wreck. He cannot live without continued presence/effect of the drug in the body. Opium reduces physical activity by depressing the central nervous system. It reduces the metabolic rate, blood pressure and respiration. Appetite is lost. Formation of digestive juices is reduced which often results in constipation.

Secretions of reproductive system organs decrease, reducing thereby the desire for sex. There are exceptions to this general rule, however.

Non-addiction prone individuals (stable personalities) do not get the intense pleasure sensation from opioids. Rather, the experience is nauseating to a few. A rare individual may even be allergic to opium. The mode of administration also affects the effects.

Opium can be identified by its characteristic smell, chemical tests and by thin layer chromatography,in which the presence of the constituent alkaloids is indicated by spray reagents and their $\mathbf{R_f}$ values.

12.9.3 Morphine

Morphine being the most important constituents of opium, is principally responsible for most of its qualities as sedative, pain killer and narcotic. In fact, it has replaced the use of opium for these purposes.

Morphine is extracted from opium. It is used in the form of its salts, usually as Morphine sulphate. Morphine is an alkaloid.

12.9.3.1 Administration

Morphine is taken usually by injection, though sometimes it is also taken by mouth. Medicinal dose of morphine sulphate is about 10-15 mg. 75 mg is the fatal dose. In the case of addicted persons, the fatal doses would be upward. Average addict takes 30 to 150 mg. of the drug every day in four or five shots.

Morphine is sometimes combined with atropine to counteract the depressant effect of morphine.

12.9.3.2 Physiological Effects

Morphine has the same physiological effect as those described for opium. Briefly, it may show excitement followed by a soporific effect, narcosis and coma.

12.9.3.3 Metabolism

Morphine is eliminated through urine. About 50% morphine is eliminated in about 8 hours. About 90% in one day. Traces are noticeable even after 48 hours.

12.9.3.4 Addiction

The drug is a very strong addictive drug. Continued use makes a person drug addict.

12.9.3.5 Identification

It is identified from the following:

1. **Melting Point.** Morphine (anhydrous) has a melting point of 250°-256° C, with decomposition.
2. **Marquis Test.** Formaldehyde and sulphuric acid give purple colour.
3. **Ammonium-molybdate Test.** Purple colour which changes to blue and then to light green.
4. Potassium calcium iodide gives fine needle crystals.
5. Paper or thin layer chromatography give characteristic R_f' values, which depend upon the system. In gas chromatography, morphine shows characteristic retention time.
6. UV and IR absorption spectra are characteristic. The former is also used to estimate morphine.

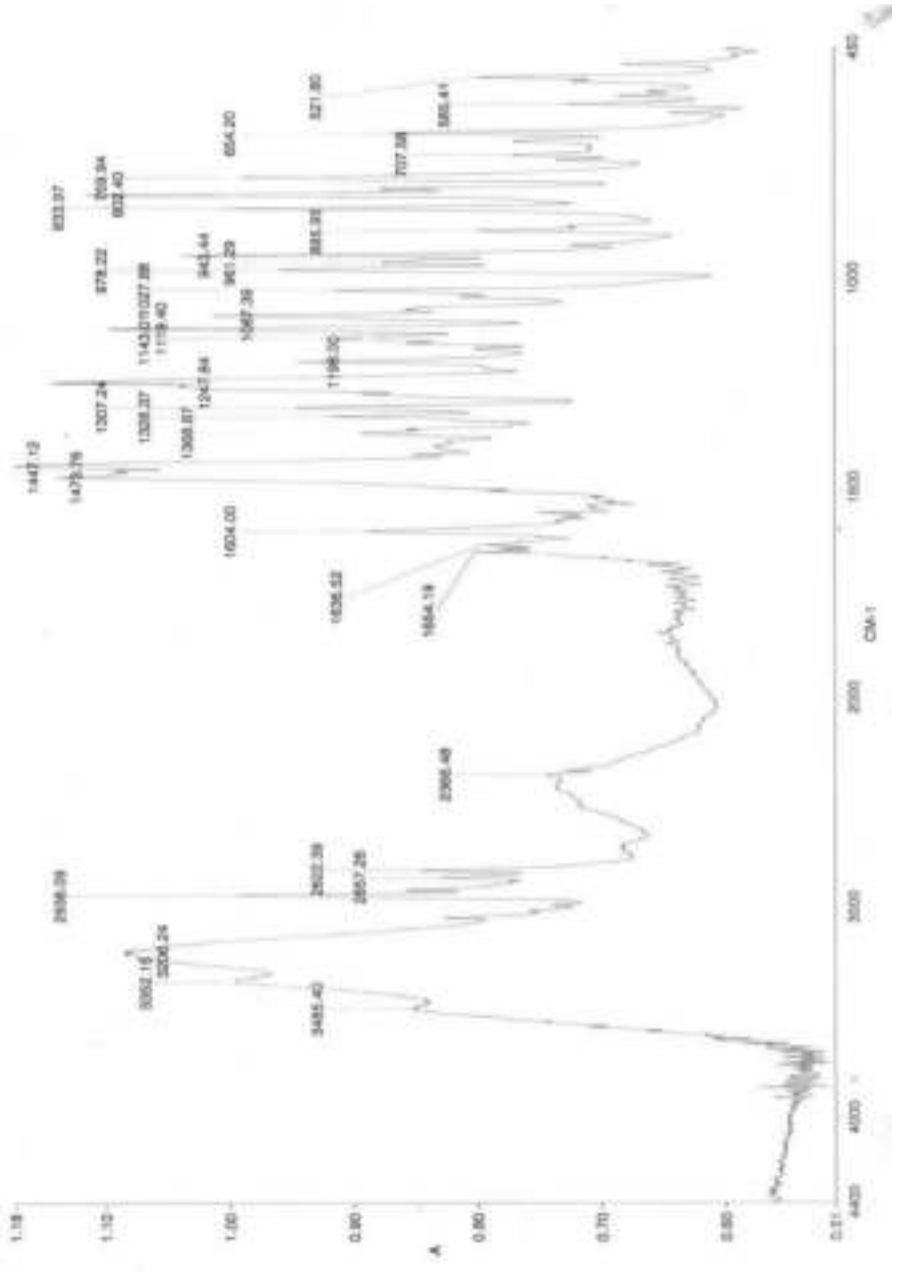

Fig. 12.4
IR spectrum of morphine

12.9.4 Heroin

Conversion of morphine to heroin needs more elaborate chemical operation. It, however, does not need extensive equipment. Morphine is refluxed with acetic anhydride for about 5 hours. Diacetyl morphine, *i.e.*, heroin, is formed. It is separated from the solution by neutralising the solution with sodium carbonate (washing soda). Heroin is separated as a precipitate, which is treated with hydrochloric acid. Heroin hydrochloride salt thus obtained is used/abused as a narcotic.

Heroin is white in colour. But heroin from Mexico is usually brown (hence the name 'brown sugar'). Its colour varies from white to almost black. The refining process creates the difference. Mexican process does not eliminate completely some gums and pigments from the crude, which create brownish colour. Golden Triangle, Golden Crescent and the Middle East countries products are usually white. Heroin content also is lower in Mexican products.

Heroin is not marketed in pure form. It is always diluted (cut). The usual street samples contain 1 to 5% heroin. Usually two types of (cutting) agents are used:

- **Diluents;** commonly used diluent is milk sugar; but other diluents like other sugars/carbohydrates are also used. Some may even mix baking powder.
- **Toxic Excipients;** commonly used excipients are quinine, procaine and lidocaine.
- **Speed Ball;** a mixture of heroin hydrochloride (or morphine sulphate) and cocaine is called speedball. It is administered either by injection or through insufflations (through body orifices). The combo has a synergic effect. It is not abused is in India to any extent.

12.9.4.1 Abuse

Heroin is abused in all modes: Smoking, inhalation, eating, drinking or injection. The usual and economical mode is by injecting. The drug is injected in the blood stream directly by the main liners.

A main (direct) liner prepares the injection by cooking heroin in a 'cooker' (spoon). He takes the required dose in a 'cooker' or any other small receptacle. He dissolves it in a small quantity of water and heats it. Matchstick heating is adequate to dissolve the drug. He draws it in a syringe (usually commercial, but in emergency eyedropper also serves) and injects it into the arm, starting from the middle of the biceps and then use the arm from the position toward the wrist and then to the back of the hand. Deterioration of the skin on the sites of pricks and stiffening of the veins necessitate this downward movement. Later he shifts to feet and then goes upward injecting the drug. Some choose odd places: neck, below the tongue, under the breasts (ladies!)

In case of a dirty solution, cotton plug is used to filter the drug at the site of the injection itself.

12.9.4.2 Physiological Effects

Heroin and other opioids affect the Central Nervous System (CNS). It is one of the strongest sedatives, depressing all body functions, free the subject from any pain, worry, immediately and the addict feels happy and relaxed. The intensity and the length of time for which the effect

lasts, depends mainly upon the quantity of the heroin injected and the extent of addiction of the addict. It slows down all physiological activities. The common symptoms of drug addiction are:

- Slower breathing, heartbeat
- Lower blood pressure
- Constipation
- Pale body colour, less oxygen intake
- Drowsiness
- Slurred speech
- Impaired mental-physical co-ordination
- Depressed reflexes
- Withdrawal Syndrome (table 2, below):

Table 12.2

Stage	Hours After intake	Symptoms
I	8-12	Nervous, anxious, irritable, fidgety, restless and belligerent
II	12-24	Yawns, sweats, running nose/eyes, goose-flesh waves, panic, confusion and depression
III	24-48	Tremors, twitching, cramps, diarrhea
IV	48-72	Symptoms peak: diarrhea and vomiting, unconsciousness and death, if neglected.

12.9.4.3 Identification

Heroin is usually identified by the following tests:

1. **Colour tests:** Marquis' reagent gives a purple colour. Frohde's reagent gives purple colour, which changes to olive green colour on standing.
2. **Micro-crystal test:** Platinum chloride and mercuric chloride give characteristic crystals.
3. **TLC:** Chromatogram visualised with iodoplatinate solution gives characteristic $\mathbf{R_f}$ value.
4. **Instrumental Modes:** IR spectophotometry, HPLC and GC-MS are confirmatory modes for heroin.

   Heroin is usually recovered in small amounts. Therefore, only non-destructive methods are used for its identifications. TLC, micro crystal test and IR Spectrophotometry are the favourite identification tests.

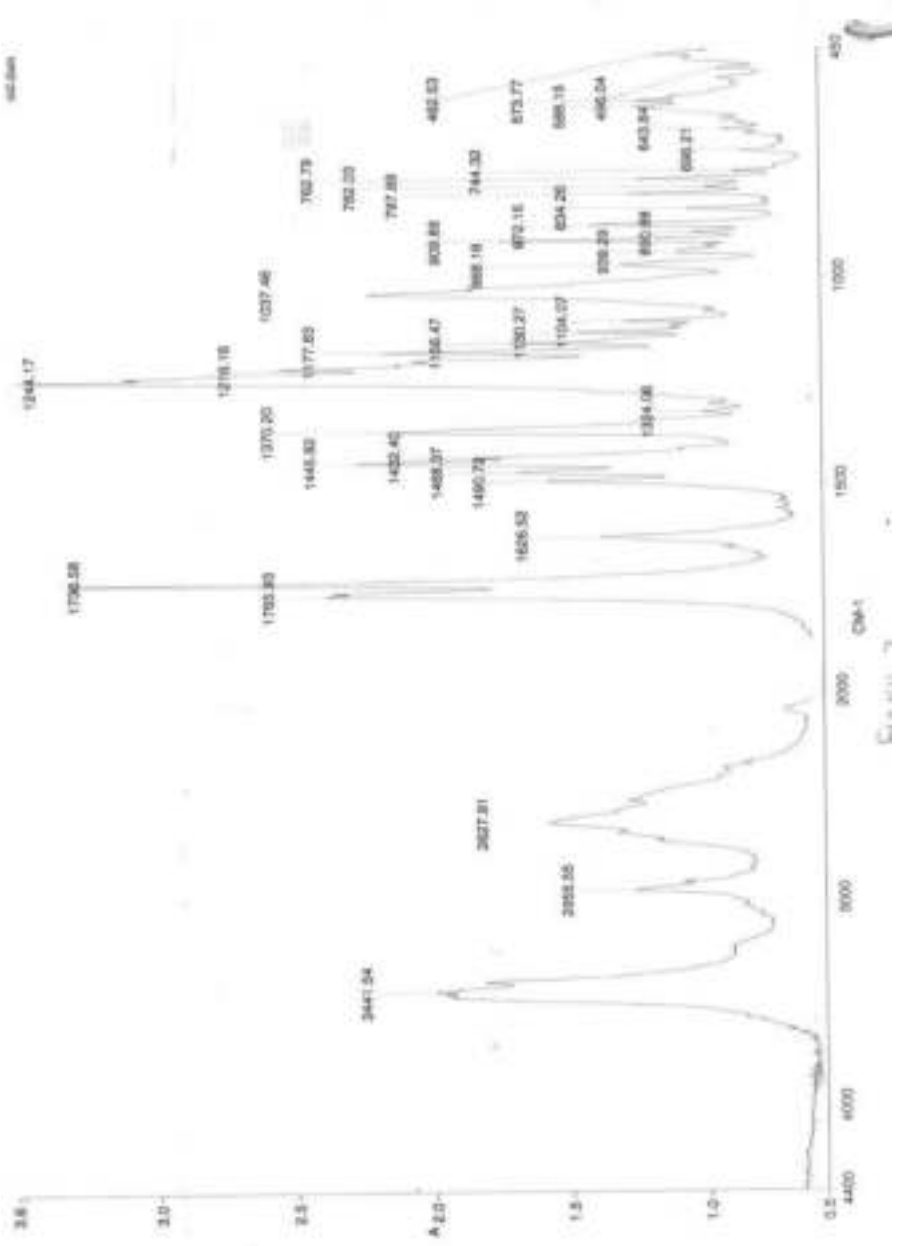

Fig. 12.5
IR trace of standard heroin

12.9.5 Barbiturates

Barbiturates are central nervous system depressants/sedatives. They are sedating and sleep-inducing and give hypnotic feeling to the users. They are used as anaesthetics or to treat epilepsy, insomnia, anxiety, or severe headaches.

Barbiturates have been used extensively in medicine as hypnotics to induce sleep and relieve pain and suffering. However, in recent years their medicinal use has declined because of their side effects and tendency to cause addiction. A new class of drugs Benzodiazepines is used in their place. Diazepam (valium) is one such drug, which is used to reduce pain/anxiety/emotional distress.

Barbiturates have been abused for suicide and murders. They account for 50% of the poisoning cases in the United Kingdom.

Barbiturates have been/are being used by the drug addicts as narcotics. They are comparatively more easily available, less costly and are considered less dangerous.

The addicts use barbiturates as substitutes for opiates. Likewise, alcoholics also sometimes take them as a substitute for liquors. The intoxication caused by barbiturates may not be so obvious as they have no smell.

Barbiturates are used as "truth serum"; for example, Pentobarbital sodium (Nembutal). Their administration creates a state of semi-consciousness in the subject. This state is conducive to get truthful answers from the subject — hence, the name "truth serum".

There are a variety of barbiturates available in the market. The common ones are:

1. Amytal (amobarbital)
2. Nembutal (pentobarbital)
3. Seconal (secobarbital)
4. Phenobarbital
5. Donnatal Butisol (butabarbital)
6. belladonna

12.9.5.1 Nature

All barbiturates are derivative of barbituric acid.

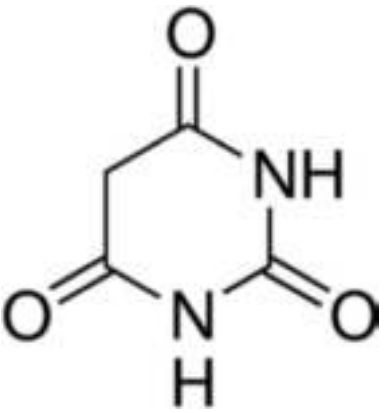

Fig. 12.6
Barbituric acid ($C_4H_4N_2O_3$)

The variations are due to substitution of hydrogen atoms by alkyl, aryl or other groups. In some, sulphur replaces the oxygen atom in between the two nitrogen atoms.

Barbiturates are known as barbitones or barbitals, the names ending in 'al' or 'one'.

The barbiturates may be long acting, intermediate acting or short acting. The barbiturates which induce sleep from 8 to 24 hours are long acting. Those of less duration (4 to 10 hours) are intermediate acting. The short acting barbiturates produce effect up to three to four hours. However, the effect varies with individuals and doses.

12.9.5.2 Administration

Barbiturates are frequently administered orally; sometimes by injection. They are usually taken alone; sometimes with other drugs especially with liquors (or cocaine).

12.9.5.3 Fatal Dose

Fatal dose of barbiturates is comparatively large, though it varies with the compound. For example, a minimum estimated lethal dose is two grams of barbiturate.

12.9.5.4 Addiction

Barbiturate addiction has the following characteristics:

1. A strong desire to continue taking the drug
2. A tendency to increase the dose
3. Both physical and psychological dependence develops.
4. Characteristic withdrawal syndrome appears within 24 hours and reaches maximum effect in 50 to 70 hours. The syndrome pattern is:

   Anxiety twitching of muscles weakening/dizziness nausea loss in blood pressure.

5. Barbiturates retard mental processes – the addict feels confused and loses control and judgment.
6. The physical vitality also diminishes.
7. Barbiturates in small doses cause sleep but in larger doses they cause insomnia.
8. An addict gets intoxicated even with a small dose because of the cumulative effect. Addiction to barbiturates resembles alcoholic intoxication. The addict loses control on motor centres, emotional control and suffers from delusions.

12.9.5.5 Metabolism

Barbiturates are metabolised in four ways:

1. The alkyl or aryl substituent gets oxidised.
2. N-alkyl group is de-alkylated.
3. Fission of the ring takes place but only to a small extent.
4. Thiobarbiturates lose sulphur.

12.9.5.6 Identification

1. Barbiturates produce blue colour with 1% solution of cobalt nitrate in alcohol and a pellet of sodium hydroxide.

2. Thin layer and gas chromatography identify and individualise barbiturates. Infrared absorption spectra are characteristic.
3. Quantitative estimation is done by U.V. absorption spectrophotometer.

12.9.6 Other Non-opiate Sedatives

Chloral hydrate, paraldehyde, bromides are other non-opiate sedatives. Out of these chloral hydrate is criminals often use it as a 'knock out' drug to knock out the victim. Half a gram is sufficient to induce sleep in a man. The drug-alcohol combo has a synergetic narcotic effect.

12.10 STIMULANTS

Stimulants activate the central nervous system. Thus, their effects are opposite to the sedatives. But this increased activity is achieved at a cost. Ultimately, this increased activity deteriorates the body functionaries due to their excessive activities. Consequently' these drugs are also narcotics. Important members are Cocaine, Benzedrine, Dexedrine, and Methedrine.

12.10.1 Cocaine

Cocaine is obtained from the leaves of Coca bush, commercially. It is white crystalline slightly volatile alkaloid. It's melting point is 96°-98° C.

12.10.1.1 Origin

Cocaine is of vegetable origin. The cocoa plant (Erythroxylon Coca L) is a bush. It is native of South America. However, it grows elsewhere also on mountain slopes. Humid climate and rich soil at temperature 20° to 30° C are ideal conditions. It grows in India also.

The useful life of the bush is 30-40 years. It may go up to up to 100 years under favourable conditions. It grows to a height of 2 to 3 metres It gives 4 crops of leaves in a year. The average yield of cocaine from dry cocoa leaves is 0.5 to 1%. A number of factors including drying process influence the yield.

The cocaine drug mafia has developed a new strain of coca plant, which is taller and has about four time cocaine than the traditional plant.

Cocaine is extracted from cocoa leaves by a number of processes. The basic nature of the alkaloid is exploited for extraction and purification. Ultimately, its hydrochloride salt in purified form is sold as the narcotic.

12.10.1.2 Use

Cocaine is a drug of choice for local anaesthesia. However, Novocain and xylocaine (Lidocaine), both synthetic drugs, are used for local anaesthesia.

12.10.1.3 Abuse as Narcotic

Cocaine is somewhat volatile. It evaporates with the passage of time. The process is hastened by the diluents, which are often used in the commercial cocaine. Cocaine is sold in three forms.

1. Wholesale dealers sell it in a rock-like solid form.
2. The rich use it in pure flake form.
3. The street form is powder, usually mixed with diluents.

Ordinarily, the dilution does not go beyond 40%. Often it is less.

The diluents commonly used are:

1. Procaine—a synthetic local anaesthetic drug
2. Milk sugar or other simple or complex sugars
3. Methamphetamine, synthetic stimulant

In fact, any chemical or food material, which is soluble in water and is not harmful to the body, can be used as diluents for cocaine.

The addict has to depend upon the word of the peddler as to the real strength of the drug (or diluent) though intelligent addict can guess the strength through inhaling or by tasting the drug.

12.10.1.4 Administration/Intake

Cocaine is taken by mouth in capsules, mixed with food or with drink, by inhaling, by application on the gums, by placing it under the tongue or by injection. The injection method gives maximum satisfaction to the user though inhaling is also considered quite satisfactory. In fact, cocaine inhaling is the most frequently utilised method. The inhaling is done in a number of ways.

1. Carrying it in a paper and inhaling it through the nostril.
2. Nose drops. It is sprayed in the nostril.
3. Sniffing from a pouch, handkerchief.
4. Taking a pinch of it like a snuff – snorting.
5. Mix it with Vaseline and rub it in the nostrils.
6. Taking it in a tiny spoon (made for the purpose), which can contain about 50 mg. of cocaine and snort the content off the spoon, placed in the nostril.
7. Pick up the dose in a straw, used for cold drinks, and snort it.

12.10.1.5 Effects of Cocaine

The effect of cocaine on an individual is immediate. The subject experiences euphoria/intense pleasure. The drug is claimed to:

1. Stimulate the central nervous system (CNS), mental and physical processes and the person is hyperactive.
2. Make the addict feel that he is capable of doing anything. He may indulge in anti-social activities.
3. Reduce inhibitions.
4. Act as a sexual stimulant.

12.10.1.6 Physiological Effects

1. Cocaine is known to:
2. Increase physiological activity: blood pressure, pulse rate, respiration
3. Reduce appetite, hence used to reduce obesity.
4. Reduce sleep.
5. Cause constipation.

6. Weaken sense of time and distance perception.
7. Cause thirst.
8. Create local anaesthetic effect on the tongue/throat, when taken orally.
9. Produce sore noses to some snorters.
10. Induce psychological stress syndrome in addicts.
11. Cause blood poisoning, anaemia in habitual users.
12. Cause infection.
13. Create toxic reaction in some cases.
14. Reduce hunger. Less food intake ultimately affects health and immune system.
15. Cause headache, nausea, cramps, delirium, and even unconsciousness in some persons.
16. Over doses makes a person aggressive, sometimes.
17. Fatal dose varies from 2.5 mg. to 1.5 g.

12.10.1.7 Addiction

Cocaine addiction indicators are:

1. Intense desire to take the drug
2. Psychological dependence
3. No appreciable tolerance
4. No physical dependence
5. No abstinence syndrome
6. Health deterioration: due to less food intake, less sleep and excessive exertion

12.10.1.8 Metabolism

Cocaine suffers extensive changes in the body. But a part of it (1 to 12%) is eliminated as such in the urine unchanged in about 24 hours. The maximum excretion is in the first six hours. It is identified from unchanged cocaine in the urine.

12.10.1.9 Identification

The following determinations help to identify cocaine:

1. **MP.** The melting points of the alkaloid and its hydrochloride are determined. They are 96° C and 197° C respectively.
2. **Scott Test.** Cobalt thiocyanate solution gives an intense blue coloured precipitate.
3. **Gold chloride Reagent.** It gives serrated needles (crystals).
4. **Thin layer and gas chromatography.** They are utilized to identify the drug.
5. **G.C/M.S.** The analysis distinguishes its different stereoisomers.
6. **UV and IR absorption spectra.** They are characteristic of the alkaloid.
7. **UV spectrophotometry.** It is used for the estimation of the drug.
8. **NMR.** It has also been used to characterise cocaine.

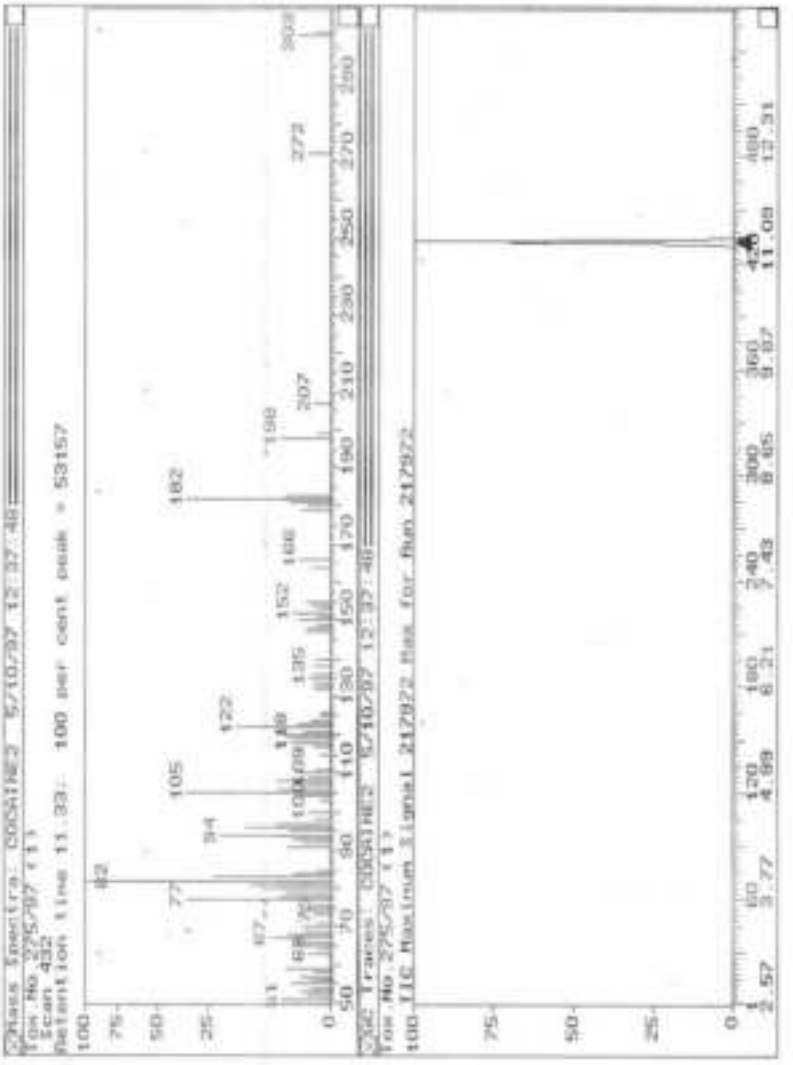

Fig. 12.7
Top: Mass spectrum of Cocaine
Bottom: GC trace of Cocaine

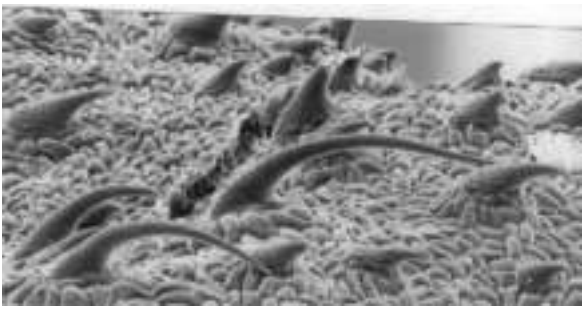

Fig. 12.8

SEM photograph of cystolic hairs on the leaf of cannabis

12.10.2 Amphetamines

The collective group of amphetamines includes amphetamine, dextroamphetamine, and methamphetamine. Medications containing amphetamines are prescribed for narcolepsy, obesity, and attention deficit/hyperactivity disorder.

Amphetamines are a group of synthetic stimulants, which are prepared from â-phenethylamine. Amphetamine has stimulant effect, similar to that of cocaine.

12.10.2.1 Administration

Amphetamine/methamphetamine, in the form of a pill, is usually taken orally. The other modes are:

1. Snorting it
2. Inhaling after vapourising it
3. Injection, after dissolving it in water
4. Placing it in contact (or rubbing it) on the body part.
5. Smoking

12.10.2.2 Effects

The drug has similar effects to those of cocaine on the human bodies.

1. The drug stimulates the central nervous system. Consequently, the sensation of pleasure, alertness and initiative are created.
2. It prevents sleep and reduces fatigue.
3. It reduces appetite and has been used as such by an obese person to reduce weight.
4. Psychomotor functions and mental processes are affected.

12.10.2.3 Addiction

Amphetamines addiction has the following characteristics:

1. Desire to take the drug repeatedly
2. Development of tolerance
3. Psychological dependence
4. Absence of physical dependence

12.10.2.4 Metabolism

Only a small amount of amphetamine is metabolised when the pH is low. At high pH, a fair percentage of the drug is metabolised to a large number of products. Unchanged amphetamine is excreted through urine in considerable amounts. It can be utilized for detection of addiction. Most of the drug (90%) is excreted within three days but small amounts of the drug can be detected even after a week of the oral administration. It is not excreted through faeces.

12.10.2.5 Identification

The following tests are common to identify the drug:

1. **Marquis Test:** Amphetamines change the orange colour of the reagent to brown.
2. **TLC/GC.** The drug gives a characteristic thin layer and gas chromatograms.
3. **UV and IR spectra.** *They* are useful modes to establish the identity/quantity of the drug.

Other Amphetamine-type stimulants (ATS) have the same general structure, similar effects and similar methods of analysis.

12.11 HALLUCINOGENS

Fig. 12.9

Psilocybin Mushroom: the source of powerful Hallucinogen Psilocybin

Hallucinogen drugs alter perception, state of consciousness and may create imaginary scenes, sounds and scents to the person who is under their influence. The origin of the drugs to start with was from the natural source like a mushroom, cactus, However, synthetic hallucinogens have since entered the field.

Important hallucinogens are cannabis (THC), peyote cactus (mescaline), mushrooms (psilocybin and psilocin), L.S.D., P.C.P., D.M.T., P.C.P.,

12.11.1 Cannabis (Bhang)

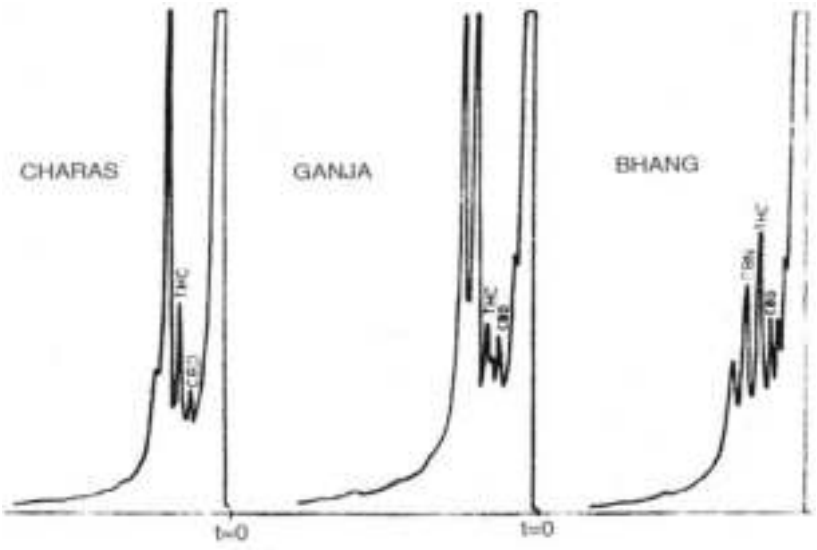

Fig. 12.10
IR spectra of cannabis

Bhang, marijuana or cannabis is synonyms with the botanical names of the plant *cannabis sativa L*. It is an annual dioecious shrub. It is usually 2 to 3 metres tall. But under favourable growth conditions the height may go up to 5 metres. The resinous contents, especially the Psych-active component, the **T**etra-**H**ydro-**C**annabinol (THC) vary in the various parts of plant. The resin is about 5% in flowering tops of the female plant and about 1% in the leaves. Even the fruit contains traces of the resin. The drug is used in three forms in India:

1. **Bhang; i**t is the flowering top and the leaves in nascent or dried form
2. **Ganja; i**t is the crude resin along with some leaves/flower residues
3. **Charas/Hashish.** WHO has defined *Charas* as: "the separated resin, whether crude or purified, obtained from the cannabis plant". The resin contains cannabinoids including tetrahydrocannabinol (THC).

   Charas may be solid or paste, depending on the method of preparation and temperature. Its colour varies from light to dark brown, to yellow, black or red. These characteristics depend mostly on the process of manufacture.
4. **Hashish oil**

   Hashish oil is also called Marijuana oil or honey oil. It is about 3-4 times stronger than *charas* and about 30-40 times stronger than *Bhang* (marijuana). It has generally a brown black colour. Its THC content is about 20 to 60%. It is a very strong hallucinogen.

   The active ingredient of all cannabis products is the same compound, the THC. Only its quantities vary. They, therefore, do not warrant separate treatment. The following points are noteworthy.

   1) In the Narcotic Drugs and Psychotropic Substances Act, 1985, the term cannabis includes practically all parts of the plants except mature stalks, fibres, seed, seed oil or cake.

2) The main psychoactive ingredient of the *Bhang, Ganja, Charas* and *hashish* oil is THC. It has been synthesised and is known as Dronabinol. However, it is not used as a drug because of its prohibitive cost of production. THC from natural source is far cheaper.
3) Cannabis (*Bhang*) has been described variously as depressant, stimulant or hallucinogen. In fact, the drug is believed to affect various individuals differently. In term of volume, it is the most abused drug in the world today.
4) Cannabis grows all over the world. The narcotic resin is obtained from the flowering tops/leaves. Fibre is obtained from its bark. Its seeds are useful food.
5) The resinous product varies in quality and quantity with the place of origin and the part of the plant.
6) The euphoria and the narcotic properties of cannabis are mainly due to THC.

Cannabis is used in three forms in India.

1) **Bhang;** it is mostly leaves.
2) **Ganja;** it *is* leaves and flowering tops of the plant.
3) **Charas;** it is mostly resinous product of cannabis, obtained from the flowering tops and leaves of the plant. It is also known as *Hashish*.

The resinous mass, contain many chemicals (More than 450 compounds have been identified). They include THC, and more than 60 cannabinoids. The resin also containscystolithic hair, glandular hair, resin glands, chlorophyll, proteins, oils, fibres, fragments of leaves, About 60 cannabinoids and 140 terpenes of the identified compounds are unique to Cannabis Sativa L.

12.11.1.1 Administration

1. Cannabis, in the most part of the world, is often smoked in cigarettes, in pipes, in *hookas*.
2. It is eaten, mixed in sweetmeats.
3. It is taken in the form of soft drinks *(sharbat)*.
4. It is administered in the form of medicinal concoction.

12.11.1.2 Effects

The effects of cannabis are confusing. As already mentioned, it is described as sedative, stimulant and hallucinogen. The major effects described are:

1. It relieves fatigue.
2. It removes inhibition.
3. It excites hunger in some and reduces hunger in others.
4. It affects perception with respect to time, space and understanding.
5. Some persons feel that they enjoy art and music better under its influence and that their creative powers are enhanced.
6. Some people suffer from hallucination. They start weeping, laughing, abusing or quarrelling. Some under its influence create a public nuisance. Some commit crime.
7. some persons suffer instability and confusion.

It is believed that excessive abuse overtime deteriorates the intelligence/memory/judgment,

12.11.1.3 Addiction

Cannabis is not addictive like opium. Ordinarily, people start with this drug and pass on to harder drugs. However, the main feature of cannabis abuse are:

1. It creates repeated craving, desire to take the drug repeatedly, perhaps in the belief that the drug will improve capabilities.
2. It does not develop tolerance.
3. It does not leave withdrawal syndrome.
4. It does not develop physical dependence.
5. It develops psychological dependence.

12.11.1.4 Metabolism

The metabolism of the important constituent, tetrahydrocannabinol (THC), has been studied. THC first changes to hydroxytetrahydrocannabinol which gets further degraded. It is excreted, along with its degradation products, through faeces (50%) and through urine (30%). Urine also excretes unchanged THC in a small amount (less than 1%). The excretion is slow and takes over a week for the elimination of most of the drugs.

Both the original compound and hydroxyl-compound are useful for identification and estimation purposes. They continue in the bodies of the regular abusers for many days.

Table 12.3

Cannabis Detection Limit Chart

S. No.	1	2	3	4	5
Intake count frequency	1	2-4/m	2-4/Week	5-6/week	Daily
Detection Limit In days	5-8	11-18	23-35	33-48	49-63

12.11.1.5 Identification

Commonly used tests for cannabis identification are:

1. **Fast Blue B reagent;** it gives violet colour with alkaline.
2. **TLC and GLC chromatograms;** they are characteristic.
3. **UV/IR spectra;** they are characteristic for identification purposes.
4. Other modes of identifications are:—
    1) **From leaves**
        - Characteristic veins and secretions.
        - Green colour even on drying. Rot may spot it brown.
        - Horn like cystolith transparent hair on the upper surface, with thick base and pointed tips
        - Microscopic bulbs can be observed under slide cover, which reacts with hydrochloric acid.

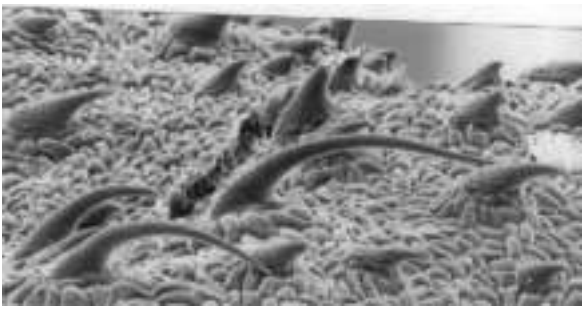

Fig. 12.11

2) **Seeds**
   - Ovoid in shape
   - Greenish yellow to brown colour
   - Whitish flesh in the kernel
   - Ridge around the circumference
   - Presence of characteristic reticulate pattern on the surface

12.11.2 LSD[2] (Lysergic Acid Diethylamide)

Lysergic acid diethylamide (LSD) is a psychedelic drug. Its psychological effects include altered awareness of the surroundings, perceptions, and feelings as well as sensations and images that seem real though they are not.

The drug is tasteless and odourless white powder with MP 80°– 85° C.

12.11.2.1 Administration

It is often sold on blotter paper, a sugar cube, or gelatin.

1. LSD is swallowed.
2. It is placed under the tongue.
3. It is taken orally, often placed in sugar cubes, blotting paper or gelatin.
4. It is injected.

LSD is a highly potent psychedelic drug. The normal dose for going on a trip is about 1 to 2 microgram per kilogram of body weight, though addiction-prone individual may tolerate up to 4 microgram (per Kg body weight) of the drug. On many individual a dose as little as 20–30 micrograms can produce a hallucinogen effect.

Quantities in milligram may prove fatal.

2. It is an acronym of its German name "Lyserg-Säure-Diäthylamid".

12.11.2.2 Effects

LSD is one of the most powerful psychedelic drugs. The drug affects the entire human mechanism, which may result in complete disorganisation of the individual and cause chaos. The effect is pronounced upon psychologically weak personalities. The main features of the experiences described are:

1. The subject experiences vivid hallucination perceiving non-existing sound, colour and visual distortions.
2. The subject loses the sense of time and space.
3. The subject is unable to discriminate between right and wrong.
4. The subject loses sense of cause and effect.

   Once, a subject started clawing out his own eyes. He described his state as being dead and under water and that when he found his vision did not work well, he wanted to pullout the eyes for better focus, to see better. (CH)
5. The effect of the drug appears in about half an hour and lasts for several hours. In some cases it creates permanent defect in the personality of the subject.

It is used mainly as a recreational drug and for spiritual reasons. However, many individuals suffer adverse reactions such as anxiety, paranoia, and delusions,

12.11.2.3 Addiction

The drug is not addictive. However, it is too drastic. A single dose has, in some cases, caused disturbance for over a year. The exact nature of its action on the human body and mind is not yet fully understood. It is possible that it may be causing damage to some organs, possibly to the brain parts. The drug, therefore, needs strict control and preventive measure against its abuse.

12.11.2.4 Metabolism

L.S.D. is metabolised in the liver to three or four different metabolic products. 60-80% is excreted into the bile.

12.11.2.5 Identification

1. ***Colour Tests;*** it gives grey colour with sulphuric acid and formaldehyde. It gives grey green colour with ammonium molybdate and brown colour with ammonium vanadate.
2. ***TLC and GLC chromatograms;*** they are characteristic.

12.12 RECENT TRENDS

The abuse of illegal drugs has gone sky-high in recent times. It can be seen from the following figures of yearly drug abuse in the USA, average of years 2002, 2003 and 2004:

Table 12.4

Yearly Drug Abuse in USA

S. No.	Drug abused	Abusers in lakhs
1.	Marijuana	255
2.	Pain Relievers	113
3.	Cocaine	58
4.	Tranquilizers	50
5.	Stimulants	30
6.	Ecstasy	14
8.	Crack(cocanine)	14
9.	Sedatives	9
10.	LSD	7
11.	Heroin	4

The extent of drug abuse is frightening and, unfortunately, it is increasing. The employers and others are highly worried about their staff's drug status. Scientists have come up with numerous tests, invasive and non-invasive, to provide a necessary check on the employees. The test is used by some employers to recruit, retain and promote drug-free workers.

The usual test materials used to check drug addiction of the persons are:

1. Blood
2. Urine
3. Oral fluid (saliva)
4. Hair

Methods have been standardised for the detection of drugs from these clue materials. for varying periods. The retention of the drug and hence detection thereof, in the clue materials, depend upon a number of factors including the nature of the drug, the health of the abuser, mode and quantity of the ingestion, However, a rough idea can be had from the following table:

Table 12.5

Approximate Retention (Detection) Time

S. No.	Substance	Urine	Hair	Blood/Oral Fluid	Remark
1	Ethanol (alcohol)	6–24 hours	up to 2 days	12–24 hrs	As Ethyl glyceride: 80 hrs in urine
2	Amphetamines	1 to 4 days	up to 90 days	12 hrs	except methamphetamine
3	Methamphetamines	3 to 5 days	up to 90 days	1–3 days	
4	Ecstasy	72 - 96 hours	up to 90 days	72 - 96 hrs	
5	Barbiturates	1 day	up to 90 days	1 to 2 days	except Phenobarbital
6	Phenobarbital	2 to 3 weeks	up to 90 days	4 to 7 days	
7	Benzodiazepines (Therapeutic use)	up to 7 days	up to 90 days	6 to 48 hrs	Chronic use: 4 to 6 weeks
8	Cocaine	2-5 days	up to 90 days	2-5 days	Kidney disorders interfere
9	Codeine	2-3 days			
10	Cotinine	2-4 days	up to 90 days	2-4 days	Nicotine Metabolite
11	Morphine	2-4 days	up to 90 days	1-3 days	
12	TCA	7-10 days	undetectable	Only detectable	Tricyclic Antidepressant
13	LSD	12-24 hrs	undetectable	2-4 days	
14	Methadone	7-30 days	up to 90 days	24 hrs	
15	Steroids	3-30 days			
16	PCP	3-7 days; used once	up to 90 days	1-3 days	up to 30 days in regular user

The testing methods for the drugs in the clues (Blood, urine, oral fluids, hair) have undergone a sea change *vis-à-vis* their sensitivity and specificity.

Table 12.6

COMMON NARCOTICS

Drug	Normal Use	Abuse	Dose	Mode of Intake	Effects	Withdrawal Symptoms	Availability/ Remarks
DEPRESSANTS							
1. Opium	Sedative	To escape reality	Variable	Smoked/ eaten/ injected	Euphoria, sleep, physical dependence. Develops tolerance	Pain, cramps, nervousness, perspiration. In acute cases death.	From poppy heads.
2. Morphine	Sedative, pain killer in acute cases	— do —	15mg	injection	— do —	— do —	One of opium alkaloids
3. Heroin	Nil, illegal manufacture	— do —	5 mg. onward	— do —	— do —	— do —	From morphine
4. Methadone-pthedin	Sedative	— do —	10 mg.	Injection/ eaten	— do —	— do —	Synthetic compound
5. Barbiturates	Sedative, pain killer, relaxant	— do —	50 mg. to 100 mg.	Swallowed/ injected	Drowsiness, sleep. No Physical dependence. Tolerance develops	Depression, incoherence, prespiration,	Synthetic derivatives of Barbituric acid.
STIMULANTS							
1. Cocaine	1. Antidote for depressant 2. To keep awake. 3. To reduce obesity	1. – do – 2. For dutch courage.	variable	Eaten/ sniffed/ injected.	Excitation: LocquaiousnessAlertness, activities increases. Nophysical depen-dence or tolerance.	Irritation, confusion, aggressiveness	1. From cocoa leaves. 2. Synthetic.

Drug	Normal Use	Abuse	Dose	Mode of Intake	Effects	Withdrawal Symptoms	Availability/ Remarks
2. Amphetamines	Antidote for depressant. To keep awake To reduce obesity	1. To escape reality. 2. For dutch courage.	2.5 mg.	Swallowed/ snuffed	Excitation: Locquaciosness Alertness, Activity increases. Nophysical depen-dence or tolerance	Irritation, confusion, aggressiveness	synthetic
HALLUCINOGENS 1. Mescaline	Nil	To escape reality	variable	oral	Illusion and hallucination	No physical dependence. Only psychological urge.	1. Peyote cactus 2. Synthetic
2. L.S.D.	Nil	— do —	50 to 250 ug.	— do —	Changes mood andbehaviour hallucina-tion, panic, extreme anxiety and mental depression	— do —	Semi synthetic. Hallucination can rear up with the same does after intervals
3. D.M.T.	Nil	— do —	variable	Smoked/ injection	Produce illusions and hallucinations	— do —	Synthetic
Cannabis	Mild Sedative, relaxant, intoxicant Hallucinogen	— do —	— do —	Smoked/ eaten	Relaxation, Euphoria Sleep in moderate doses.	— do —	Plant origin
Solvent Vapours	Variable	— do —	— do —	Sniffing	Excitation, confusion, tremors	— do —	From legitimatesources, Gasoline, nailpolish remover, lighter fluid, lacquer

12.13 CASE LAW

Supreme Court Cases (21st Century)

12.13.1 Contraband Quantity in Mixtures[3]

Author's Summary

It is a landmark judgment on Narcotics. The Amendment of the NDPS Act has drastically changed the punishment pattern. Now it is based on the quantity of the drug recovered. Law specified 3 categories small quantity (5 g), commercial quantity, (250 g) and the intermediate quantities (5-250 g).

The Narcotics are handled in mixtures. There was confusion whether the weight of the mixture or of the drug in the mixture should be considered for punishment. The SC decided in favour of the latter.

Highlights italicised

Relevant Extracts (Verbatim)

The relevant facts of the case are that on 5 March 2001, the Intelligence Officer was informed by an informant that two persons with certain drugs would be arriving by a Tamil Nadu Transport Corporation Bus at Thiruvananthapuram Bus Stand. The Officer along with other persons and the informant went to the bus stand and waited for the bus. At about 9.00 am, the two accused alighted from the Tamil Nadu Transport Corporation bus. They were identified by the informant. They were intercepted by the officials. The officials disclosed their identity and the accused were searched. When asked about possession of narcotic drugs, it was admitted by the accused that they were carrying 4 kg. of heroin and they handed over the bag to the Officer. The bag contained two packets wrapped in Tamil newspapers secured with brown adhesive tape in which light grey powder was found. Two samples of 5 gms. each from both the drug packets was packed, sealed and sent for testing to the Laboratory. The accused were arrested, but the second accused escaped while on the way to produce them before the Magistrate. On 26 March 2001, the Customs House Laboratory, Cochin sent a report confirming the samples as answering to the test of crude heroin, a narcotic drug covered under the N.D.P.S. Act. The report further said that the Laboratory was not equipped to conduct a quantitative test. Thus, the samples were sent for quantitative test. On 22 February 2002, a quantitative test was done in the Customs Laboratory, Chennai where the purity was tested and the quantitative test report indicated as follows:

S. No.	Marking on the cover	Lab No.	Wt. of the sample received with plastic cover	Wt. of the remnant received with plastic cover
1.	Section 1	235	5.6 g	5.0 g Purity 1.4%
2.	Section 3	236	4.9 g	4.6g Purity 1.6%

3. The accused-appellant was charged with the offence committed under section 8(c) read with sections 21 and 29 of the N.D.P.S. Act by the Intelligence Officer, Narcotic Control Bureau. The Special Judge for Trial of Cases under the N.D.P.S. Act found that the substance found

3. *Micheal Raj v Intelligence Officer, Narcotic Control Bureau,* AIR 2008 SC 1720 : 2008 Cr LJ 2250.

in possession of the accused was an opium derivative which has been defined under section 2(xvi), and under section 2(xvi)(e) a preparation, containing more than 0.2% of morphine or diacetylmorphine, is an opium derivative; and that since this contraband article contained 1.4% and 1.6% heroin it is an opium derivative, and punishable under section 21 of the N.D.P.S. Act. Since the manufactured drug being carried weighed 4.07 kg., it would come under section 21(c) being a commercial quantity, but since the accused is only a carrier and is not the beneficiary of the transaction, he would not be awarded the maximum sentence and would be awarded the minimum sentence of 10 years' rigorous imprisonment and a fine of Rs 1 lakh, in default of payment of fine rigorous imprisonment for one more year. On an appeal being preferred, the High Court found the accused guilty. The High Court said that section 21 of the N.D.P.S. Act when read with section 2(xi) which defines manufactured drug, makes it evident that the packet seized from the appellant is a manufactured drug. The offence can be in respect of the manufactured drug as well as preparation of manufacture drug. Preparation has been defined in section 2(xx). Again, any mixture of narcotic drug with other substances will also come within section 21 of the N.D.P.S. Act, so the rate of purity becomes irrelevant. The purity test does not advance the case of the accused. As per the High Court, it is the whole quantity of mixture which has to be taken into consideration for imposing the punishment under section 21 of the N.D.P.S. Act. The High Court maintained the conviction and sentence awarded by the Special Judge.

4. The only submission made by Shri K.V. Viswanathan, learned counsel for the appellant is confined to the limited issue relating to the sentence of the appellant under section 21 of the N.D.P.S. Act. As per the learned counsel, the conviction and sentence of the appellant are contrary to law because the total quantity of contraband seized from him was 4.07 kg. Since the purity of heroin is 1.4% and 1.6% respectively in two samples, therefore the quantity of heroin in possession is only 60 g. [(1.4+1.6)/2 = 1.5% of 4.07 kg. = 60 gs.). Thus, the total quantity of heroin seized is below 250 g., *i.e.,* below the commercial quantity. It is submitted that it is not the total weight of the substance allegedly recovered that is material, but the percentage content of heroin translated into weight that is relevant.

5. On the other hand, Shri Vikas Sharma, learned counsel appearing for the respondent urged that it is only the weight of the substance found in possession of the appellant and recovered from him ought to be seen, and once the substance tested positive for heroin, its percentage content in the substance was irrelevant, the entire substance would be viewed as a narcotic drug and consequently the total weight of the substance ought to be taken into consideration for determining whether it was a small quantity or a commercial quantity.

6. The provisions of the N.D.P.S. Act were amended by the Narcotic Drugs and Psychotropic Substances (Amendment) Act, 2001 (Act 9 of 2001) (w.e.f 2 October 2001), which rationalized the punishment structure under the N.D.P.S. Act by providing graded sentences linked to the quantity of narcotic drugs or psychotropic substances carried. Thus, by the Amending Act, the sentence structure changed drastically. Small quantity and commercial quantity were defined under section 2(xxiiia) and section 2(viia) respectively. New section 21 also provides for proportionate sentence for possessing small, intermediate and commercial quantities of offending material. As per Entry 56 of the Notification dated 19 October 2001 issued by the Central Government which deals with heroin, small quantity has been mentioned as 5 g. and commercial quantity has been mentioned as 250 g. So, the basic question for decision is whether the contravention involved in this case is small, intermediate or commercial quantity under section 21 of the N.D.P.S. Act, and whether the total weight of the substance is relevant or percentage of heroin content translated into weight is relevant for ascertaining the quantity recovered from the accused.

7. To appreciate the arguments of the parties, the relevant sections of the N.D.P.S. Act have to be looked into, which are as under: section 2(viia) (inserted by Amending Act 9 of 2001 w.e.f. 2 October 2001).

'Commercial quantity', in relation to narcotic drugs and psychotropic substances, means any quantity greater than the quantity specified by the Central Government by notification in the Official Gazette; section 2(xxiiia) (inserted by Amending Act 9 of 2001 w.e.f. 2 October 2001).

'Small quantity', in relation to narcotic drugs and psychotropic substances, means any quantity lesser than the quantity specified by the Central Government by notification in the Official Gazette; section

Section 2(xvi).

'Opium derivative' means—

(a) **Medicinal opium,** that is, opium which has undergone the processes necessary to adapt it for medicinal use in accordance with the requirements of the Indian Pharmacopoeia or any other Pharmacopoeia notified in this behalf by the Central Government, whether in powder form or granulated or otherwise or mixed with neutral materials;

(b) **Prepared opium,** that is, any product of opium by any series of operations designed to transform opium into an extract suitable for smoking and the dross or other residue remaining after opium is smoked;

(c) **Phenanthrene alkaloids,** namely, morphine, codeine, thebaine and their salts;

(d) **Diacetylmorphine,** that is, the alkaloid also known as diamorphine or heroin and its salts; and

(e) **All preparations** containing more than 0.2% of morphine or containing any diacetylmorphine;

Section 2 (xi)

'Manufactured drug' means—(a) All coca derivatives, medicinal cannabis, opium derivatives and poppy straw concentrate;

(b) Any other narcotic substance or preparation which the Central Government may, having regard to the available information as to its nature or to a decision, if any, under any International Convention, by notification in the Official Gazette, declare to be a manufactured drug; but does not include any narcotic substance or preparation which the Central Government may, having regard to the available information as to its nature or to a decision, if any, under any International Convention, by notification in the Official Gazette, declare not to be a manufactured drugs.

Section 21. *Punishment for contravention in relation to manufactured drugs and preparations [substituted by the Amending Act 9 of 2001, w.e.f. 2 October 2001]: Whoever, in contravention of any provision of this Act or any rule or order made or condition of licence granted thereunder, manufactures, possesses, sells, purchases, transports, imports inter-State, exports inter-State or uses any manufactured drug or any preparation containing any manufactured drug shall be punishable,—*

(a) where the contravention involves small quantity, with rigorous imprisonment for a term which may extend to six months, or with fine which may extend to Rs 10,000, or with both;

(b) where the contravention involves quantity, lesser than commercial quantity but greater than small quantity, with rigorous imprisonment for a term which may extend to ten years, and with fine which may extend to one lakh rupees;

(c) where the contravention involves commercial quantity, with rigorous imprisonment for a term which shall not be less than ten years but which may extend to twenty years and

shall also be liable to fine which shall not be less than one lakh rupees but which may extend to two lakh rupees:

Provided that the court may, for reasons to be recorded in the judgment, impose a fine exceeding two lakh rupees.

8. The Statement of Objects and Reasons concerning the Amending Act of 2001 is as follows:

Narcotic Drugs and Psychotropic Substances Act, 1985 provides deterrent punishment for various offences relating to illicit trafficking in narcotic drugs and psychotropic substances. Most of the offences invite uniform punishment of minimum ten years' rigorous imprisonment which may extend up to twenty years. While the Act envisages severe punishments for drug traffickers, it envisages reformative approach towards addicts. In view of the general delay in trial it has been found that the addicts prefer not to invoke the provisions of the Act. The strict bail provisions under the Act add to their misery.

Therefore, it is proposed to rationalise the sentence structure so as to ensure that while drug traffickers who traffic in significant quantities of drugs are punished with deterrent sentences, the addicts and those who commit less serious offences are sentenced to less severe punishment. This requires rationalisation of the sentence structure provided under the Act. It is also proposed to restrict the application of strict bail provisions to those offenders who indulge in serious offences.

9. The entry of the Notification under which the substance found in possession of the appellant falls is Entry 56 or Entry 239. The relevant portion of the Notification dated 19 October 2001 issued by the Central Government reads as under:

S.O. 1055(E), dated 19 October 2001. In exercise of the powers conferred by clauses (viia) and (xxiiia) of section 2 of the Narcotic Drugs and Psychotropic Substances Act, 1985 (61 of 1985) and in supersession of Ministry of Finance, Department of Revenue Notification S.O. 527(E), dated 16 July 1996, except as respects things done or omitted to be done before such supersession, the Central Government hereby specifies the quantity mentioned in columns 5 and 6 of the Table below, in relation to the narcotic drug and psychotropic substance mentioned in the corresponding entry in columns 2 to 4 of the said Table, as the small quantity and commercial quantity respectively for the purposes of the said clauses of that section.

Sl. No	Name of Narcotic Drug[4] Heroin	Small Quantity (in gm)	Commercial Quantity (in g./kg.).
56	Diacetylmorphine	5	250 g

Any mixture or preparation that of with or without a neutral material, of any of the above drugs.

* Lesser of the small quantity between the quantities given against the respective narcotic drugs or psychotropic substances mentioned above forming part of the mixture.

** Lesser of the commercial quantity between the quantities given against the respective narcotic drugs or psychotropic substances mentioned above forming part of the mixture.

10. The possession of offending substance would be considered an offence punishable under the N.D.P.S. Act, as heroin is an opium derivative as per section 2(xvi)(e) which says that all preparations containing more than 0.2% of morphine or containing any diacetylmorphine is an opium derivative. Further, according to section 2(xi), all opium derivatives fall under the category of manufactured drug.

4. Non-proprietary/chemical names.

Thus, we conclude that the offending substance is an opium derivative and hence a manufactured drug, the possession of which is in contravention of the provisions of section 8 of the N.D.P.S. Act which prohibits certain operations to the effect that no person shall produce, manufacture, possess, sell, purchase, transport, warehouse, use, consume, import inter-State, export inter-State, import into India, export from India or tranship any narcotic drug or psychotropic substance.

11. *In the present case, the opium derivative which has been found in possession of the accused-appellant is prohibited under section 8 of the N.D.P.S. Act and thus punishable under section 21 thereof. The question is only with regard to the quantum of punishment.*

12. As a consequence of the Amending Act, the sentence structure underwent a drastic change. The Amending Act for the first time introduced the concept of commercial quantity in relation to narcotic drugs or psychotropic substances by adding clause (viia) in section 2, which defines this term as any quantity greater than a quantity specified by the Central Government by notification in the Official Gazette. Further, the term 'small quantity' is defined in section *2,* clause (xxiiia), as any quantity lesser than the quantity specified by the Central Government by notification in the Official Gazette. Under the rationalised sentence structure, the punishment would vary depending upon whether the quantity of offending material is 'small quantity', 'commercial quantity' or something in-between.

13. It appears from the Statement of Objects and Reasons of the Amending Act of 2001 that the intention of the legislature was to rationalize the sentence structure so as to ensure that while drug traffickers who traffic in significant quantities of drugs are punished with deterrent sentence, the addicts and those who commit less serious offences are sentenced to less severe punishment. Under the rationalised sentence structure, the punishment would vary depending upon the quantity of offending material. Thus, we find it difficult to accept the argument advanced on behalf of the respondent that the rate of purity is irrelevant since any preparation which is more than the commercial quantity of 250 gms. and contains 0.2% of heroin or more would be punishable under section 21(c) of the N.D.P.S. Act, because the intention of the legislature as it appears to us is to levy punishment based on the content of the offending drug in the mixture and not on the weight of the mixture as such. This may be tested on the following rationale. Supposing 4 gms. of heroin is recovered from an accused, it would amount to a small quantity, but when the same 4 gms. is mixed with 50 kgs. of the powdered sugar, it would be quantified as a commercial quantity. In the mixture of a narcotic drug or a psychotropic substance with one or more neutral substance, the quantity of the neutral substance/s is not to be taken into consideration while determining the small quantity or commercial quantity of a narcotic drug or psychotropic substance. It is only the actual content by weight of the narcotic drug which is relevant for the purposes of determining whether it would constitute small quantity or commercial quantity. The intention of the legislature for introduction of the amendment as it appears to us is to punish the people who commit less serious offences with less severe punishment and those who commit grave crimes, such as trafficking in significant quantities, with more severe punishment.

14. In the case of *Ouseph* alias *Thankachan v State of Kerala*, (2004) 4 SCC 446, this Court in para 8 has held as under:

The question to be considered by us is whether the psychotropic substance was in a small quantity and if so, whether it was intended for personal consumption. The words small quantity have been specified by the Central Government by the notification dated 23 July 1996. Learned counsel for the State has brought to our notice that as per the said notification small quantity has been specified as 1 gram. If so, the quantity recovered from the appellant is far below the limit of small quantity specified in the notification issued by the Central Government. It is admitted that each ampoule contained only 2 ml and each ml contains only .3 mg. This means the total quantity found in the possession of the appellant was only 66 mg. This is less than 1/10th of the limit of small quantity specified under the notification.

From the aforesaid decision, we find that the Court has taken the quantity of the narcotic drug or psychotropic substance found in the mixture, relevant for the purpose of imposition of punishment.

15. The learned counsel for the respondent placed reliance on the decision of this Court in *Amarsingh Ramjibhai Barot v State of Gujarat*, (2005) 7 SCC 550 : AIR 2005 SC 4248 : 2005 Cr LJ 4521, in support of his contention that the entire material found in possession irrespective of the content of the offending material has to be taken into consideration while imposing the punishment. In *Amarsingh* case (*supra*), two persons, namely, Amarsingh and Danabhai were apprehended. Amarsingh was found carrying a plastic bag which contained a black-coloured liquid substance weighing 920 gms. Similarly, 4.250 kg. of grey-coloured substance was recovered from Danabhai. Samples were sent to the Forensic Science Laboratory (FSL). The FSL report indicated that the sample from Amarsingh was opium as described in the N.D.P.S. Act containing 2.8% anhydride morphine apart from pieces of poppy flowers and the sample relating to Danabhai was reported to be opium as described in the N.D.P.S. Act having 1.2% anhydride morphine and also containing pieces of poppy flowers. Both the accused were charged and tried under sections 15, 17 and 18 read with section 29 of the N.D.P.S. Act. The High Court found that the conviction under sections 17 and 18 read with section 29 of the N.D.P.S. Act was not correct, but convicted Amarsingh under section 21(c) and also under section 21(c) read with section 29 of the N.D.P.S. Act, for individually being in possession of opium and for being jointly, in conspiracy with the other accused. The High Court found the accused possessed of commercial quantity and convicted and sentenced him for 10 years rigorous imprisonment plus fine of Rs 1 lakh. Being aggrieved, Amarsingh approached this Court. This Court has held in para 14 of the judgment as under:

> *There does not appear to be any acceptable evidence that the black substance found with the appellant was coagulated juice of the opium poppy and any mixture, with or without any neutral material, of the coagulated juice of the opium poppy. FSL has given its opinion that it is opium as described in the N.D.P.S. Act. That is not binding on the court.*

The Court further held that the evidence also does not indicate that the substance recovered from the appellant would fall within the meaning of sub-clauses (a), (b), (c) or (d) of section 2(xvi), but residuary clause (e) would apply and consequently it would amount to opium derivative as all opium derivatives fall within the expression 'manufactured drugs' Thus, the Court arrived at the conclusion that what was recovered from the appellant was manufactured drug and the offence proved against the appellant fell clearly within section 21 of the N.D.P.S. Act for illicit possession of manufactured drug. The Court concluded and held in para 17 as under:

> *In respect of opium derivatives (at S.I. No. 93) in the said notification, 5 grams is specified as small quantity and 250 grams as commercial quantity. The High Court was, therefore, right in finding that the appellant was guilty of unlawful possession of commercial quantity of a manufactured drug. Consequently, his case would be covered by clause (c) and not clause (a) or (b) of section 21 of the N.D.P.S. Act.*

This court has, therefore, upheld the imposition of minimum punishment under section 21(c) of 10 years rigorous imprisonment with fine of Rs 1 lakh.

16. On going through *Amarsingh* case (*supra*), we do not find that the Court was considering the question of mixture of a narcotic drug or psychotropic substance with one or more neutral substance. In fact that was not the issue before the Court. The black-coloured liquid substance was taken as an opium derivative and the FSL report to the effect that it contained 2.8% anhydride morphine was considered only for the purposes of bringing the substance within the sweep of section 2(xvi) (e) as 'opium derivative which requires a minimum 0.2% morphine. The content found of 2.8% anhydride morphine was not at all considered for the purposes of deciding whether the substance recovered was a small or commercial quantity and the Court took into consideration the entire substance as an opium derivative which was not mixed with one or more neutral substance/s.

Thus, Amarsingh case (supra) cannot be taken to be an authority for advancing the proposition made by the learned counsel for the respondent that the entire substance recovered and seized irrespective of the content of the narcotic drug or psychotropic substance in it would be considered for application of section 21 of the N.D.P.S. Act for the purpose of imposition of punishment. We are of the view that when any narcotic drug or psychotropic substance is found mixed with one or more neutral substance/s, for the purpose of imposition of punishment it is the content of the narcotic drug or psychotropic substance which shall be taken into consideration.

17. *In the present case, the narcotic drug which was found in possession of the appellant as per the analyst's report is 60 g. which is more than 5 g., i.e. small quantity, but less than 250 g, i.e., commercial quantity. The quantity of 60 g is lesser than the commercial quantity, but greater than the small quantity and, thus, the appellant would be punishable under section 21(b) of the N.D.P.S. Act. Further, it is evident that the appellant is merely a carrier and is not a kingpin.*

18. In these circumstances, the ends of justice would be subserved if we reduce the sentence of the accused-appellant to 6 years rigorous imprisonment with a fine of Rs 20,000 and in default of payment of fine rigorous imprisonment for six months. We order accordingly.

12.13.2 Commercial or Small Quantity of Contraband[5]

Author's Summary

Two persons, travelling in a bus, were searched. 2 Kg of contraband was recovered from them. They said they were just the carrier of the drug for another person. He was arrest and later freed on bail. When the contraband was examined, it contained 2.5 % of the drug. The authorities got the bail cancelled. The accused approached the Supreme Court for bail. The court after scrutiny of the Law/case law found that the case is not bailable as the net quantity of the drug was far more than 5 g. They dismissed the bail application.

Highlights italicised

Relevant Extracts (Verbatim)

2. Whether an order of bail granted in favour of the appellant herein could have been directed to be cancelled on the basis of a report of analysis of the articles recovered from him containing 'heroin' is the core question involved herein.

3. Before, however, we advert to the said question, we may notice the factual matrix involved in the matter.

On or about 14 August 2004, the luggage of two persons, *viz.*, Abdul Munaf and Zahid Hussain, who were travelling in a bus were searched and allegedly contraband weighing 2 kg. was recovered. A purported statement was made by the said accused persons that the said contraband (heroin) was meant to be delivered to the appellant. Nothing was recovered from him. Apart from the said statements of the said accused persons, no other material is available on record to sustain a charge against him. On the basis of the said statement, the appellant was arrested on 15 August 2004. Allegedly, a statement was made by him in terms of section 67 of the Narcotic Drugs and Psychotropic Substances Act, 1985 (for short "the Act"). Appellant contends that he was tortured and the statement was obtained forcibly from him on some blank documents. He later on retracted therefrom.

Indisputably, the seized articles were sent for chemical examination to the Government Opium and Alkaloid Works, Neemuch. A report was sent to the investigating officer on 23 September 2004 stating that the sample did not contain any contraband substance. Appellant

5. *Sami Ullaha v Superintendent, Narcotic Central Bureau,* AIR 2009 SC 1357 : 2009 Cr LJ 1306.

thereafter filed an application for discharge. The prosecution moved the court for sending the substance allegedly recovered from the co-accused persons for its examination by the Central Revenue Control Laboratory, New Delhi. It was rejected by the court opining that there was no provision in the Act for sending the sample to another laboratory. The court, however, did not pass an order of discharge in favour of the appellant but released him on bail, stating:

> *Accordingly, as mentioned above, there is no ground that by accepting the application of the complainant and order be passed for sending the second sample for examination to another laboratory. If the investigating officer so desires, then in accordance with the ruling expounded as above, he is free to send the second sample to any of the laboratories for its examination at his own level. On the basis of the above mentioned observations, the application of the complainant is rejected.*

4. The prosecution, however, sent another sample to the Central Revenue Control Laboratory, New Delhi. A report dated 6 January 2005 was sent opining that the sample under reference was tested positive for Diacetyl-morphine (Heroin), which according to the said report was found to be 2.6% of the sample tested.

5. Thereafter, an application for cancellation of bail was filed on 4 February 2005. By an order dated 15 March 2005, the bail granted to the appellant was cancelled relying on or on the basis of the second report obtained by the respondent from the Central Revenue Control Laboratory, New Delhi stating:

> *While receiving guidance from the abovementioned citations, I arrive at the conclusion that under the present facts, the second sample which was sent for examination and according to its receipt the seized substance was heroin, and on the basis of which charges have been levelled against the accused persons, and the prosecution has right to send second sample for chemical examination, and as such there are charges of serious nature against the accused persons in which there provisions (sic) to award punishment of imprisonment of the term of at least ten years and fine of Rs 1 lakh, as well as under section 37 of the Act, in case of recovery of psychotropic substances in the quantity of commerce and trade, bail cannot be granted until the court does not arrive at the conclusion to the effect that the accused is not guilty of such an offence, and in case of granting him bail such an offence will not be committed by him during the course of his remaining free on bail.*

12. However, a distinction even is made as regards grant of bail in relation to a commercial quantity and a small quantity. The commercial quantity has been defined in section 2(viia) of the Act to mean "any quantity greater than the quantity specified by the Central Government by notification in the Official Gazette".

13. We will advert to the question of the definition of "Chemical Examiner" a little later. The question, however, as to whether the contraband found came within the purview of the commercial quantity within the meaning of section 2(vii a) or not is one of the factors which should be taken into consideration by the courts in the matter of grant or refusal to grant bail. Even, according to the Central Revenue Control Laboratory, New Delhi, only 2.6% of the sample sent was found to be containing heroin. Small quantity in terms of the notification issued under sections 2(vii a) and 2(xxiii a) is as under:

S No.	(Narcotic Drug/Psychotropic Substance		Small Quantity	Commercial Quantity
	(International Name	Non-proprietary Name (NN)	5 g	250 g
	Morphine	Morphine		

The quantity, thus, alleged to have been recovered from the co-accused persons could be said to be the intermediate quantity and, thus, the rigours of the provisions of section 37 of the Act relating to grant of bail may not be justified.

In *Ouseph* alias *Thankachan v State of Kerala*, (2004) 4 SCC 446, this Court held:

> *"8. The question to be considered by us is whether the psychotropic substance was in a small quantity and if so, whether it was intended for personal consumption. The words 'small quantity' have been specified by the Central Government by the notification dated 23 July 1996. Learned Counsel for the State has brought to our notice that as per the said notification small quantity has been specified as 1 gram. If so, the quantity recovered from the appellant is far below the limit of small quantity specified in the notification issued by the Central Government. It is admitted that each ampoule contained only 2 ml and each ml contains only 3 mg. This means the total quantity found in the possession of the appellant was only 66 mg. This is less than 1/10th of the limit of small quantity specified under the notification.*
>
> *** *** ***

11. On account of the aforesaid fact situation, we are inclined to believe that the small quantity of buprenorphine (Tidigesic) was in the possession of the appellant for his personal consumption and, therefore, the offence committed by him would fall under section 27 of the N.D.P.S. Act."

So the basic question for decision is whether the contravention involved in this case is small, intermediate or commercial quantity under section 21 of the N.D.P.S. Act, and whether the total weight of the substance is relevant or percentage of heroin content translated into weight is relevant for ascertaining the quantity recovered from the accused.

5. It was held that the percentage of heroin content translated into weight is relevant. Reference was made to an earlier judgment and observed in para 16 as follows:

"16. In *Ouseph v State of Kerala*, (2004) 4 SCC 446, this Court in para 8 has held as under: (SCC p 447)

> *8. The question to be considered by us is whether the psychotropic substance was in a small quantity and if so, whether it was intended for personal consumption. The words 'small quantity' have been specified by the Central Government by the Notification dated 23 July 1996. Learned counsel for the State has brought to our notice that as per the said notification small quantity has been specified as 1 gram. If so, the quantity recovered from the appellant is far below the limit of small quantity specified in the notification issued by the Central Government. It is admitted that each sample contained only 2 ml and each ml contains only 3 mg. This means the total quantity found in the possession of the appellant was only 66 mg. This is less than l/10th of the limit of small quantity specified under the notification.*

From the aforesaid decision, we find that the Court has taken the quantity of the narcotic drug or psychotropic substance found in the mixture, relevant for the purpose of imposition of punishment."

6. In view of what has been stated in the said case the appeal deserves to be dismissed which we direct.

12.13.3 Identified Opium: morphine content Immaterial[6]

Author's Summary

It is a case of seizure of opium. The SC in this case ruled that If opium is identified , the NDPS law does not need its analysis for morphine, etc. for conviction/punishment. If it were a derivative /preparation from opium, the analysis was needed.

The SC, therefore, decided that the appellant has no *locus standi.*

Highlights italicised

6. In the Supreme Court of India, Criminal Appeal No. 816 of 2011: *Harjit Singh of Punjab,* [Judgment: Dr. B.S. Chauhan, J. date of decision 30 March 2011.].

Relevant Extracts (Verbatim)

Facts and circumstances giving rise to this appeal are that on 4 July 2003, a police party was proceeding from Focal Point, Mandi Gobindgarh to G.T. Road on patrol duty in a government vehicle. When the police party reached near the culvert of minor in the area of village Ambe Majra, the police party spotted the appellant who was coming on foot, from the side of Ambe Majra carrying a plastic bag in his right hand. On seeing the police, the appellant turned to the left side of the road. The police party apprehended the appellant, being suspicious of him. In the meantime, Ashok Kumar, an independent witness also came to the spot and joined the police party. The appellant was apprised of his right of being searched in the presence of a Gazetted Officer and in that respect his statement was recorded.

Shri Dinesh Partap Singh, Assistant Superintendent of Police, was summoned to the spot by the Investigating Officer and in his presence, Amarjit Singh, Inspector (PW-3) searched the plastic bag of the appellant and the substance contained therein was found to be opium. Two samples of 10 g each of the opium were taken. The remaining opium was found to be 7.10 Kgs. The samples and the remaining opium were sealed and taken into possession by the police party.

14. Opium is essentially derived from the opium poppy plant. The opium poppy gives out a juice which is opium. The secreted juice contains several alkaloid substances like morphine, codeine, thebaine Morphine is the primary alkaloid in opium.

15. Opium is a substance which once seen and smelt can never be forgotten because opium possesses a characteristic appearance and a very strong and characteristic scent. Thus, it can be identified without subjecting it to any chemical analysis. It is only when opium is in a mixture so diluted that its essential characteristics are not easily visible or capable of being apprehended by the senses that a chemical analysis may be necessary. In case opium is not mixed up with any other material, its chemical analysis is not required at all. "Of course, an analysis will always be necessary if there is a mixture and the quantity of morphine contained in mixture has to be established for the purpose of definition (of opium under the Opium Act)." (Vide: *Baidyanath Mishra v State of Orissa*, 1968 (34) CLT 1 (SC); *State of Andhra Pradesh v Madiga Boosenna*, AIR 1967 SC 1550 : 1967 Cr LJ 1398 : (1967) 3 SCR 871).

16. However, the aforesaid cases have been decided under the Opium Act and cannot be the authority so far as deciding the cases under the N.D.P.S. Act. Thus, chemical analysis of the contraband material is essential to prove a case against the accused under the N.D.P.S. Act.

17. The N.D.P.S. Act defines "opium" under section 2(xv) as under:

(a) the coagulated juice of the opium poppy; and

(b) *any mixture, with or without any neutral material, of the coagulated juice of the opium poppy, but does not include any preparation containing not more than 0.2% of morphine.*

18. Coagulated means solidified, clotted, curdled – something which has commenced in curdled/solid form.

In case the offending material falls in clause (a) then the proviso to section 2(xv) would not apply. The proviso would apply only in case the contraband recovered is in the form of a mixture which falls in clause (b) thereof.

19. Relevant part of the chemical analysis made by the Forensic Science Laboratory, Punjab, Chandigarh in the instant case, reads as under:

> *On analysis of the substance kept in the bundle under reference, it is established that the substance is opium and percentage of morphine is 0.8%* (Emphasis added).

21. In the instant case, the material recovered from the appellant was opium. It was of a commercial quantity and could not have been for personal consumption of the appellant. Thus, the appellant being in possession of the contraband substance had violated the provisions of section 8 of the N.D.P.S. Act and was rightly convicted under section 18(b) of the N.D.P.S. Act. The instant case squarely falls under clause (a) of section 2(xv) of the N.D.P.S. Act and clause (b) thereof is not attracted for the simple reason that the substance recovered was opium in the form of the coagulated juice of the opium poppy. It was not a mixture of opium with any other neutral substance. There was no preparation to produce any new substance from the said coagulated juice. For the purpose of imposition of punishment if the quantity of morphine in opium is taken as a decisive factor, Entry No. 92 becomes totally redundant. Thus, as the case falls under clause (a) of section 2(xv), no further consideration is required on the issue. More so, opium derivatives have to be dealt with under Entry No. 93, so in case of pure opium falling under clause (a) of section 2(xv), determination of the quantity of morphine is not required. Entry No. 92 is exclusively applicable for ascertaining whether the quantity of opium falls within the category of small quantity or commercial quantity.

25. Thus, the aforesaid judgment in *E. Micheal Raj* (Supra) has no application in the instant case as it does not relate to a mixture of narcotic drugs or psychotropic substances with one or more substances.

> *The material so recovered from the appellant is opium in terms of section 2(xv) of the N.D.P.S. Act. In such a fact-situation, determination of the contents of morphine in the opium becomes totally irrelevant for the purpose of deciding whether the substance would be a small or commercial quantity. The entire substance has to be considered to be opium as the material recovered was not a mixture and the case falls squarely under Entry 92.*

Undoubtedly, the FSL Report provided for the potency of the opium giving particulars of morphine contents. It goes without saying that opium would contain some morphine which should be not less than the prescribed quantity, however, the percentage of morphine is not a decisive factor for determination of quantum of punishment, as the opium is to be dealt with under a distinct and separate entry from that of morphine.

26. In view of the above, we do not find any substance in the appeal. It is devoid of any merit and, accordingly, dismissed.

12.13.4 Personal Search[7]

Author's Summary

The police, in this case, seized a bag containing 1.75 kg opium. The trial court convicted/sentenced the culprit. The convict appealed first to HC and then to SC on the plea that law for personal search was not observed. Both courts dismissed the appeal as the seizing the bag was not personal search. SC quoted law and precedences.

Highlights italicised

Relevant Extracts (Verbatim)

The prosecution story is that on 23 September 1994 at around 2.30 pm, Inspector Ram Pal Singh (PW-4) along with SI Gurdeep Singh, ASI Satpal Singh (PW-5) and other officials were on duty and coming from village Hassanpur to village Mirzapur. After reaching near the bridge of canal minor while going on *kacha* path, the police party noticed the appellant coming from the bank of canal. On seeing the police party, the appellant tried to run away but on suspicion, he was

7. *Jarnail Singh v State of Punjab,* AIR 2011 SC 964 : 2011 Cr L J 1738.

apprehended. On enquiry, he informed the police about his name, parentage, address At that time, he was carrying a bag (*thaili*) in his right hand. PW-4 suspected that the appellant was carrying some incriminating articles in his bag. The search was conducted and the police party recovered 1 Kg and 750 gram opium from his custody.

3. Ten grams of opium was put into a tin container as a sample. It was duly sealed. The entire case property was taken into possession *vide* memo Ex. PD attested by SI Gurdeep Singh and ASI Satpal Singh. The seal after use was handed over to ASI Satpal Singh (PW-5). The appellant could not produce any valid licence or permit for possession of the said opium. On personal search, currency notes amounting to Rs 25 was also recovered from the accused and the same was taken into possession *vide* memo Ex. p 1 signed by the appellant. Ruqa Ex. PF was sent to the police station and subsequently the FIR was registered. Inspector, Ram Pal (PW-4) recorded the statements of the witnesses and arrested the appellant.

* * *

5. The Addl. Sessions Judge *vide* its final order and judgment dated 19 May 1999 convicted and sentenced the appellant under section 18 of the N.D.P.S. Act, as noticed above. The High Court, in an appeal, *vide* judgment dated 12 May 2008 affirmed the findings of the Sessions Court and dismissed the appeal filed by the appellant. Hence the appeal before this Court.

* * *

12. .. … it is accepted that the narcotic/opium, *i.e.,* 1 kg. and 750 grams was recovered from the bag (*thaili*) which was being carried by the appellant.

> *In such circumstances, section 50 would not be applicable. The aforesaid section can be invoked only in cases where the drug/narcotic/N.D.P.S. substance is recovered as a consequence of the body search of the accused. In case, the recovery of the narcotic is made from a container being carried by the individual, the provisions of section 50 would not be attracted.*

This Court in the case of *Kalema Tumba v State of Maharashtra,*[8] discussed the provisions pertaining to "personal search" under section 50 of the N.D.P.S. Act and held as follows:

> *…… ……..if a person is carrying a bag or some other article with him and narcotic drug or psychotropic substance is found from it, it cannot be said that it was found from his person.*

Similarly, in the case of *Megh Singh v State of Punjab*[9], this Court observed that:

> *A bare reading of section 50 shows that it applies in case of personal search of a person. It does not extend to a search of a vehicle or container or a bag or premise.*

The scope and ambit of section 50 was also examined by this Court in the case of *State of Himachal Prades v Pawan Kumar,* Appeal (crl.) 222 of 1997, decided on 8 April 2005 (SC).[10] In paragraph, 10 and 11, this Court observed as follows:—

> *10. We are not concerned here with the wide definition of the word "person", which in the legal world includes corporations, associations or body of individuals as factually in these type of cases search of their premises can be done and not of their person. Having regard to the scheme of the Act and the context in which it has been used in the section it naturally means a human being or a living individual unit and not an artificial person. The word has to be understood in a broad common-sense manner and, therefore, not a naked or nude body of a human being but the manner in which a normal human being will move about in a civilised society. Therefore, the most appropriate meaning of the word "person" appears to be — "the body of a human being as presented to public view usually with its appropriate coverings and clothing". In a civilised society appropriate coverings and clothings are considered absolutely essential and no sane human*

8. (1999) 8 SCC 257 : AIR 2000 SC 402 : 1999.
9. (2003) 8 SCC 666 : AIR 2003 SC 3184.
10. (2005) 4 SCC 350 : AIR 2005 SC 2265
also see: *Ganga Kumar Srivastava v State of Bihar*, AIR 2005 SC 3123 : (2005) 6 SCC 211; *Balbir Kaur v State of Punjab,* AIR 2009 SC 3036 : (2009) 15 SCC 795.

being comes in the gaze of others without appropriate coverings and clothings. The appropriate coverings will include footwear also as normally it is considered an essential article to be worn while moving outside one's home. Such appropriate coverings or clothings or footwear, after being worn, move along with the human body without any appreciable or extra effort. Once worn, they would not normally get detached from the body of the human being unless some specific effort in that direction is made. For interpreting the provision, rare cases of some religious monks and sages, who, according to the tenets of their religious belief do not cover their body with clothings, are not to be taken notice of. Therefore, the word "person" would mean a human being with appropriate coverings and clothings and also footwear.

***11.** A bag, briefcase or any such article or containtc., can, under no circumstances, be treated as body of a human being. They are given a separate name and are identifiable as such. They cannot even remotely be treated to be part of the body of a human being. Depending upon the physical capacity of a person, he may carry any number of items like a bag, a briefcase, a suitcase, a tin box, a thaila, a jhola, a gathri, a holdall, a carttc., of varying size, dimension or weight. However, while carrying or moving along with them, some extra effort or energy would be required. They would have to be carried either by the hand or hung on the shoulder or back or placed on the head. In common parlance it would be said that a person is carrying a particular article, specifying the manner in which it was carried like hand, shoulder, back or hetc. Therefore, it is not possible to include these articles within the ambit of the word "person" occurring in section 50 of the Act." It has come in evidence that although the body search of the appellant was conducted but no recovery of any narcotic was made. The body search only led to the recovery ofRs. 25 from his pocket.*

* * *

Having considered the entire material on the record, the trial court as well as the High Court have concurrently found the appellant guilty. We are unable to find any perversity or any miscarriage of justice in the findings so recorded. Finding no merit, we dismiss the appeal.

12.14 ADDITIONAL CASE LAW

12.14.1 Bhang not a Narcotic[11] under NDPS Act

2. As per the prosecution version, 15½ kgs. of hemp (*bhang*) was recovered from the possession of the appellant when he was travelling in a train. For that recovery, the appellant was charged for the offence punishable under section 20B of the Act and after the trial, he was punished under the aforesaid section.

3. Counsel for the appellant at the very outset raised the contention that the hemp (*bhang*) is not a narcotic or psychotropic drug as defined under the Act and hence its possession is not an offence. He submitted that cannabis plant and cannabis hemp are two different contrabands under the Act. Cannabis (hemp) has been defined under section 2(iii) of the Act which includes *Charas*, *Ganja* and also any mixture with or without any neutral material of any of the above forms of cannabis or any drink prepared. He submitted that according to the definition of '*Ganja*' given in clause (b) of section 2(iii) of the Act, *Ganja* is the flowering or fruiting tops of the cannabis plant which excludes the seeds and leaves when not accompanied by the tops. He submitted that the *bhang* is the leaves of the cannabis plant and it has not been included in the definition cannabis (hemp) as defined under section 2(iii) of the Act. He further submitted that in the Act, the possession of the cannabis plant has not been made punishable and only its cultivation has been prohibited and made punishable under section 8 of the Act. He submitted that *bhang* as such has not been included in the definition of cannabis (hemp) and its sale, import or export and possession has not been made punishable under the Act. However, under the provisions of the Punjab Excise Act (hereinafter referred

11. *Arjun Singh v State of Haryana,* 2005 Cr LJ 253 (P&H).

to as 'the Excise Act'), the possession of *Bhang* has been made punishable in the definition of 'Intoxicating drugs' as under section 3(13) of the Excise Act, *bhang* has been included in the definition of the intoxicating drug. Therefore, learned counsel for the appellant contended that conviction and sentence of the appellant under section 20B of the Act is wholly illegal and without jurisdiction. In support of his contention, learned counsel for the appellant has relied upon three judgments of different High Courts, including this Court *viz., Sam v State of Uttar Pradesh,* 1995 (3) Rec Cri R (Cri) 44 : 1995 All LJ 1108; *Mane v State of Rajasthan*, 1996 (2) Rec Cri R (Cri) 2 : 1996 Cr LJ 37 : 1997 (1) Crimes 164; and *Gurdial Sgh v State of Punjab,* 2002 (3) Rec Cr R (Cri) 334.

4. *Per contra*, learned counsel for the respondent though submitted that bhang falls under the definition of cannabis (hemp) as defined under section 2(iii) of the Act but he could not cite any contrary judgment in support of his contention.

5. After hearing the arguments of the learned counsel for the parties, I am of the opinion that this appeal deserves to be allowed and the conviction and sentence of the appellant are liable to be set aside. In all the aforesaid three judgments, it has been held by different High Courts, including this Court, that *bhang* (hemp) does not fall under the definition of cannabis (hemp) as defined under section 2(iii) of the Act. Thus, its possession does not constitute an offence punishable under the Act.

6. In *Samid's* case, 1995 All LJ 1108 : 1995 (3) Rec Cri R (Cri) 449 (supra), the Allahabad High Court summoned the officers dealing with the narcotic drugs and cases relating thereto to explain the Court whether *bhang* is a narcotic or psychotropic drug and the possession of which is punishable under the Act or not. In response to that, the letter given by the Assistant Director, Narcotics Control Bureau, Varanasi was placed before the Court in which it was clearly stated that so far as the question of inclusion of '*bhang*' under the Act is concerned, it is explicit in the Act itself that '*bhang*' is not covered under the Act. Section 8 of the Act lays down prohibition of certain operations and prohibits the transaction in regard to *Ganja* only and not the *bhang*. After considering the said letter and the definition of cannabis (hemp) as given under section 2(iii) of the Act and the 'cannabis plant', as given in section 2(iv) of the Act, the Court came to the conclusion that '*bhang*' is not covered under the Act. Therefore, no person can be punished for its possession under the Act. However, it was held that under the Excise Act, the possession of *bhang* is punishable but not under the Act.

7. Similarly in *Manjee's* case, 1996 Cr LJ 3787 (supra), the Rajasthan High Court has elaborated and analysed the various definitions given under the Act and then came to the conclusion that *bhang* does not fall under the definition of cannabis (hemp) as defined under section 2(iii) of the Act by observing as under:—

> *13. It is apparent from aforesaid two enactments that under Act No. 2 of 1950 Charas, Ganja and Bhang are included within the definition of cannabis (hemp) whereas under N.D.P.S. Act bhang is excluded. Bhang does not fall within the definition of cannabis (hemp) as defined under section 2(iii) of the N.D.P.S. Act. It is also to be noticed that under Act No. 2 of 1950 cultivation of only cannabis (hemp) plant i.e. Charas, Ganja and Bhang is an offence under section 54(b) and punishable under section 54(g) of the said Act whereas under N.D.P.S. Act cultivation of any cannabis plant which means any plant of the genus cannabis as defined under section 2(iv) of N.D.P.S. Act is punishable under section 20(a) read with section 20(b)(1) of the said Act. In my humble opinion although bhang is excluded from the definition of cannabis (hemp) under the N.D.P.S. Act yet it does fall within the definition of cannabis plant and as such its cultivation is punishable under section 20(a) read with section 20(b)(i) of the said Act. I am also of the opinion that cannabis (hemp) is one of the species of cannabis plant, therefore, it cannot be held that since 'Bhang' is excluded from the definition of cannabis (hemp) under the N.D.P.S. Act one of the species of cannabis plant, therefore, its cultivation is not an offence and it is not punishable under section 20(b)(i) of the said Act.*

14. In my considered opinion cultivation of '*Bhang*' is punishable under N.D.P.S. Act although it is not included within the definition of cannabis (hemp) and not Act No. 2 of 1950 within the meaning of Article 254 of the Constitution of India. As regards cultivation of *Bhang* is concerned, the N.D.P.S. Act would prevail over Act No. 2 of 1950 and later enactment passed by the Legislature of State shall be deemed to be repugnant and void to the extent of its inconsistency to the former enactment passed by Parliament.

15. However, it is made clear that personal use and sale of *Bhang* is not an offence under rule 24 of Rajasthan Narcotic Drug and Psychotropic Rules, 1984, since in the present case the question of possession and sale of *Bhang* is not involved, therefore, it is left open to be decided in an appropriate case." In *Gurdial Singh's* case, 2002 (3) Rec Cr R (Cri) 334 (*supra*) this Court also came to the aforesaid conclusion while observing as under:—

> *13. It is apparent from aforesaid two enactments that under Act No. 2 of 1950 Charas, Ganja and Bhang are included within the definition of cannabis (hemp) whereas under N.D.P.S. Act bhang is excluded. Bhang does not fall within the definition of cannabis (hemp) as defined under section 2(iii) of the N.D.P.S. Act. It is also to be noticed that under Act No. 2 of 1950, cultivation of only cannabis (hemp) plant i.e., Charas, Ganja and Bhang is an offence under section 54(b) and punishable under section 54(g) of the said Act whereas under N.D.P.S. Act cultivation of any cannabis plant which means any plant of the genus cannabis as defined under section 2(iv) of N.D.P.S. Act is punishable under section 20(a) read with section 20(b)(i) of the said Act. I am also of the opinion that cannabis (hemp) is one of the species of cannabis plant, therefore, it cannot be held that since Bhang is excluded from the definition of cannabis (hemp) under the N.D.P.S. Act one of the species of cannabis plant, therefore, its 27 July 1992 passed by the learned Additional Sessions Judge convicting the appellant under section 20B of the Act is set aside and the appellant is acquitted of the charge framed against him.*

12.14.2 Cannabis is contraband[12]

The answer to the query that whether *ganja* seized in the instant case is contraband or not, is the evidence of the Deputy Director, FSL, Guwahati. The FSL received a parcel sent to the Director of the FSL consisting of 28 exhibits, enclosed in a sealed carton, with paper cover. He described the articles as follows:- "28 sealed envelopes marked from Sl. No. 1 to Sl. No. 28 having twenty eight closed polythene packets containing 24 gram dry plant materials in each. Marked here as DN-107/2011(1) to DN-107/2011(28) respectively" and the result of his examination is "The Ext.DN107/2011(1) to DN-107/2011(28) gave positive tests for cannabis (*ganja*)". This witness has not been subjected to cross-examination by the defensedefence and there is no evidence on record to discard his evidence. Therefore, the Court accepts his evidence. As the samples, examined by the Deputy Director, FSL, Guwahati, gave a positive test for cannabis (*ganja*), in the absence of evidence to impeach the evidence led by him, there is no doubt that the seized suspected *ganja* was a contraband.[12]

12. *Emdadul Hoque v State of Assam,* 2018 Cr LJ (NOC) 642 (GAU.) : Criminal Appeal (J) No. 47 of 2012, Decided on 10 July /2017 (Gau HC).

CHAPTER 13

ALCOHOL

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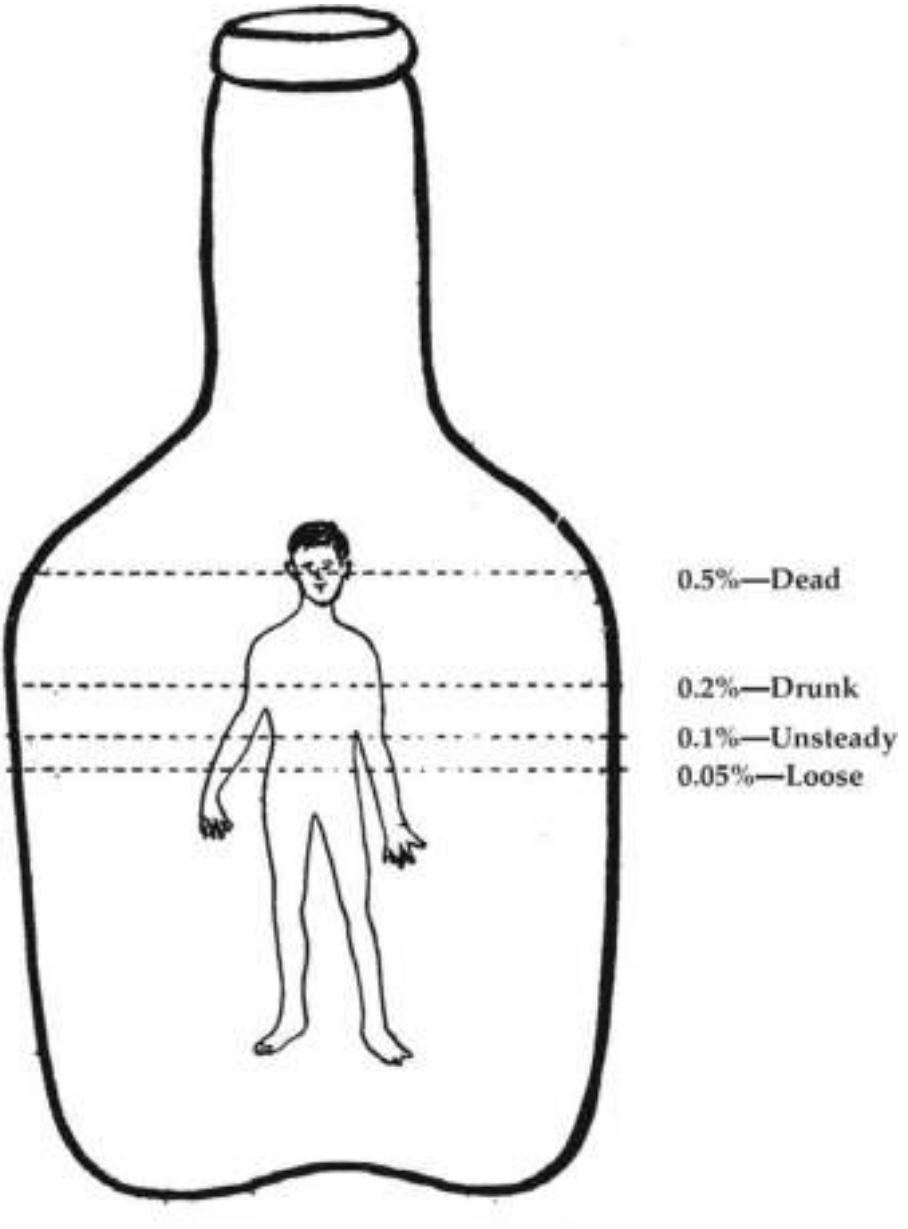

Fig. 13.1
Drinks, drinking, drunk, dead: Blood alcohol

13.1 GENERAL

The Quantity of alcohol intake determines whether the drink is a Poison…or a Remedy

An alcoholic drink or alcoholic beverage is a drink that contains alcohol (ethyl alcohol/ethanol). It is a depressant. In low doses, it causes euphoria, reduces anxiety, and enhances sociability. In higher doses, it causes intoxication (drunkenness). In still higher doses, it causes stupor, unconsciousness, coma and death.

Long-term abuse of alcohol is alcoholism. It leads the victim to physical dependence and makes him a physical/mental/social wreck.

Drinking in common parlance is intake of alcoholic beverages. It plays an important social role in many cultures. Most countries have regulated their production, sale, and consumption. In some countries there is prohibition, ban on drinking. However, alcoholic drinks are legal in most parts of the world. The global alcoholic drink industry exceeded one trillion dollars in 2014.

It appears that drinking was known even in prehistoric times among most of the old civilisations. They prepared the drinks through the fermentation process, which is also the current process for the manufacture of alcoholic drinks

Alcohol is one of the oldest intoxicants known to mankind. Its use or misuse was known in India even before it was known in most other countries. It has been described in Indian literature long before the birth of Christ. Ever since there have been continuous efforts to control its consumption because of its devastating effects on human life. Many countries, including India, have tried prohibition but with little success. In some states (Gujarat, Bihar and Nagaland; as well as in the Union Territory of Lakshadweep) of India there is prohibition.

In the U.S.A., roughly 50% of all the persons involved in cases of assault are under the influence of alcohol. Likewise, 40% of the victims of assaults too are under the influence of alcohol.

Alcohol has adversely influenced the rate of road accidents. In the United States of America, every year 20,000 persons die, and another one million persons are injured in road accidents. Intoxicated drivers cause the majority of these accidents! The chances of an intoxicated driver causing an accident are about fifty times more than that of a sober driver.

In India, we do not have reliable figures of death due to a drunken driver. The National Crime Record Bureau (NCRB) has given data for the years 2008 to 2012 (chart below) but these figures are apparently wrong[1]:

1. The Apex Court had commented on the data stating:
   In regard to the figures of death or injury due to drunken driving there is a tendency to under estimate or under-report in order not to impede the right of victims and/or their legal heirs to receive compensation.
   The remark indicates that the actual figures would be significantly higher.

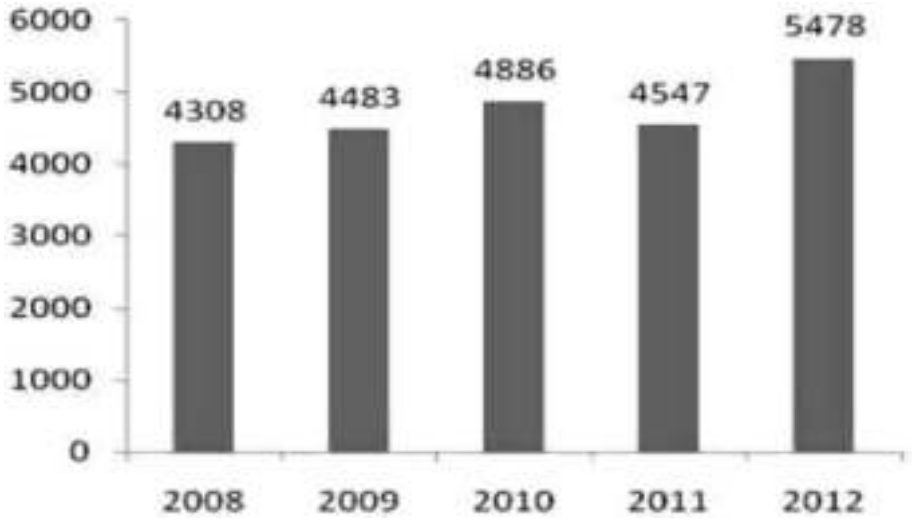

Fig. 13.1
Number of alcohol-related deaths in Road Accident (NCRB)

Table 13.1

Percent increase year-on-year

Year	2007	2008	2009	2010	2011	2012
Total number of deaths	4042	4308	4483	4658	4833	5008
Y-o-Y increase (%)		6.60%	4.1	9.00%	–6.90%	20.50%

The report suggests that about 1.5% of all the total 4.64 lakh road accidents were caused by drunken driving or driving under influence of drug or alcohol, resulting in injuries to 6,295 people. The Ministry of Road Transport and Highways puts Road Accidents in 2015, caused by drivers under the influence of alcohol as well as the fatalities much higher — 3.3% of all road accidents and 4.6% of all fatalities from road accidents.

Of the two official analyses of road accidents, the National Crime Records Bureau's report suggests that about 1.5% of all the total 4.64 lakh road accidents were caused by drunken driving or driving under influence of drug or alcohol, resulting in injuries to 6,295 people. The offence, however, according to the report, resulted in 2,988 deaths, accounting for just over 2% of all fatalities in road accidents.

Numbers would suggest drunken driving is only a drop in the ocean of road accidents, which resulted in 1.48 lakh deaths in 2015, though the Supreme Court called it one of the major causes of road accidents.

The number of accidents and deaths that alcohol causes on the road is clearly a matter of contention and likely higher than any of these reports suggest.

In 2011, the Ministry had admitted that drunken driving was one of the leading causes of road accidents and attributed as many as 27,152 accidents to it. In comparison, its 2015 report attributes 16,298 accidents to alcohol and the NCRB attributes only 6,970 accidents to it.

The truth seems to be far more serious.

Alcohol-related problems have been classified in the following categories:

1. Mental and behavioural disorders
2. Nervous system degeneration
3. Heart diseases onset
4. Pancreatic problems
5. Liver fibrosis and cirrhosis and liver failure
6. Neurotic problems
7. Gastritis problems
8. Accidental alcoholic poisoning
9. Drunken driver road accidents
10. Factory accidents due to drinking
11. Suicidal drinking

Prohibition laws add new dimensions to the problem. Illegal imports, smuggling, illicit manufacture, consumption of dangerous substitutes like methylated spirit, production and consumption of cheap and dangerous imitations and forgery of liquor permits are some of the consequent problems of prohibitions.

A few years ago, in Haryana, some illicit 'liquor' was consumed on a joyful event. The unauthorised 'vendor' sold them a methyl alcohol solution instead of an alcoholic drink. The incident resulted in deaths on a large scale. (CH)

One of the greatest tragedies of drinking spurious drinks, of recent times, occurred in Kerala[2]*. The tragic toll of the tragedy was:*

Dead, 31;

Blinded, 6;

Seriously injured, 500. (CH)

Crime involving alcohol, directly or indirectly, is increasing at a significant rate. The police, the prosecution, and the judiciary must, therefore, know the various facets of alcohol-related crime: its nature, effects, detection, and process to deal effectively with such crimes.

Alcohol: Mother of Crimes

(USA statistics)

1. 15% of robberies in America (about 197,000) were committed by liquor drinkers.
2. The average number of violent victimizations each year totals to about 11.1 million, (128,790 incidents were by liquor drinking offenders.
3. 37% of rapes and sexual assaults (about 149,000) were committed by liquor drinkers.
4. 27% of aggravated assaults (about 509,859) were by liquor drinking offenders.

2. *Chandran v State of Kerala,* Appeal No. 1528 of 2005 decided on 4 April 2011(SC).

5. 25% of simple assaults (about 1,445,304) were committed who were drinkers
6. 57% of intimate violence on female victims was committed by offenders while drinking.
7. 3 out of 4 incidents in spousal abuse were by liquor drinking offenders.
8. Federal research shows that 40% of convicted murderers used alcohol before or during the homicide.

13.2 NATURE

The active ingredient of all liquors is alcohol, also known as ethyl alcohol or ethanol. It is present in different amounts in different liquors[3].

13.2.1 Classification

The classification of alcoholic beverages is based on alcoholic content[4]:

1. **Beers;** they are un-distilled fermented products, mainly from barley. The alcoholic content is about 5% by volume. Range: 3 to 15%. Examples are beer, ale and stout.
2. **Wines;** they are also mainly un-distilled products, usually from fruits (Grapes, Apple,). The normal alcohol content is about 12%. Range: 8 to 17%. Examples are: Champagne, hock, burgundy, claret,
3. **Spirits;** they are distilled alcoholic drinks. The alcohol content is over 40% usually. Range varies from 15 to 80 % or more. Examples are whiskey, brandy, rum, gin, vodka and a host of other drinks.

The manufacturers perform two main acts to make their drinks healthy and popular. Firstly, they remove the undesirable unwanted products of fermentation, called undesirable congeners. Secondly, they add ingredients to their product, for pleasing colour, specific taste and aroma at the fermentation stage itself. The sum-total of these changes determine the quality of the liquor.

Other materials contained in fermented liquors are cereals, sugars, juices, spices, salts, colouring matter, aldehydes, ketones, higher alcohol, essential oils, esters and acids. These ingredients are important in the identification of illicit, adulterated or imitation liquors. They confer individuality to the liquor.

13.2.2 Properties

Alcohol in the pure state is a colourless, transparent liquid. It boils at 78.4°C. It is miscible with water in all proportions. It has a pleasant odour and a burning taste. It causes irritation when tender body tissues are exposed to it.

Alcohol is a good solvent. It is used extensively in industry, especially in the pharmaceutical industry. On burning, it gives carbon dioxide, water and no particulate residue. Alcohol is being used increasingly as a clean motor fuel. Usually, as motor fuel, it is used as a mixture with petrol.

3. Liquor is the common name for all alcoholic drinks/beverages
4. The concentration of alcohol in a beverage is usually given as the percentage of alcohol by volume: the number of milliliters (ml) of pure ethanol in 100 ml of beverage.

13.2.3 Production

There are many methods, both chemical and biological for the production of alcohol on commercial scale. In chemical methods, ethene, aldehydes, ketones, esters, halides, are used as base materials. Even cellulose fibre is used for its production. However, alcohol for beverages is prepared by the fermentation of sugars, molasses, grains, fruit juices and starches.

Fermentation is a complex enzymatic process. The enzymes are obtained from yeast. It is carried out under controlled conditions. The final fermented mass contains about 10% alcohol. It is concentrated/purified by distillation for the production of spirits. Wines/bears are not distilled. They are handled differently to produce potable liquor.

13.2.4 Absorption

When an alcoholic drink is taken, it immediately starts getting absorbed in the body through the stomach membrane and small intestine. About 20% alcohol is absorbed almost immediately while the rest is absorbed in about half an hour to two hours. Body tissues of certain persons absorb alcohol more easily than those of others. Many factors affect absorption including:

1. **Rate of Consumption;** the faster a person consumes drinks, the quicker the BAC will rise
2. **Concentration/strength;** the concentration/strength of alcohol in the liquor affects absorption: greater the concentration, quicker is the absorption.
3. **Health;** healthy person takes more time to absorb the alcohol absorption is quicker in physically weak person. Perhaps the difference is due to fat deposition in the body tissues.
4. **Food;** if the stomach is empty, the absorption of alcohol is facilitated and is quicker than when the stomach is full. Proteinous and fatty food delays absorption.
5. **Tolerance:** Habitual drinkers absorb alcohol quickly. They can take more alcohol without being the worse for it. The mechanism of tolerance has not been fully understood.
6. **Person's preconceived expectations** of alcohol; it determines the effect more than the amount of alcohol. For example, people who set out to get "drunk" tend to get drunk even on look-alike drink.
7. **Sex of the subject;** females absorb alcohol slowly.

Other factors affecting absorption are:

8. **Mood**
9. **Illness**
10. **Fatigue**

Alcohol, on absorption, enters the bloodstream and is distributed uniformly in all the body fluids. Bones, hairs, nails and fat of the body do not absorb it to any significant extent. The equilibrium is reached in about half an hour to two hours, depending upon the factors mentioned above. However, if the drinking is continued, the equilibrium is not reached.

Alcohol concentration during the drinking period is higher in the arteries than in the veins.

The uniform distribution of alcohol in the body makes it possible to use any of the following fluids for determining Blood Alcohol Concentrations (BAC):

1. Blood
2. Urine
3. Breath
4. Saliva
5. Perspiration
6. Spinal cord fluid
7. Brain fluid

Ordinarily, blood, urine and breath are employed to test the quantity of alcohol consumed. Due to variations in water content in various body fluids, the alcohol concentrations vary. However, the concentration in the fluid is converted/expressed in terms of Blood Alcohol Concentrations **(BAC)**.

13.2.5 Elimination

Immediately after absorption, the system starts the elimination of alcohol. Most of it (about 90%) is metabolized by the system mainly by the liver. The enzyme alcohol dehydrogenase converts alcohol first to acetaldehyde and another enzyme convert it to acetic acid and finally to water and carbon dioxide. The rate of metabolism is constant. It is slightly less than 0.015% of the blood alcohol concentration per hour. The rest of the alcohol (~ 10%) is eliminated by the lung (exhaled), sweat pores and through urine as such. This alcohol is utilised for test purposes by taking appropriate sample of the body fluid.

The rate of elimination varies with individuals. Different research workers give varying estimates for the rate of elimination. However, the commonly accepted rate of elimination is about 10 millilitres of absolute alcohol per hour. In terms of whisky, a large peg is eliminated in about three hours.

Some scientists are of the opinion that the rate of elimination varies with the concentration of alcohol in the system but the consensus is that the rate is constant. It appears that whereas the elimination of alcohol by metabolism is constant but the rate of elimination through breath, urine and perspiration varies. Overall, rate of elimination is about 0.015% of the concentration of alcohol in the blood. Thus, greater the concentration of alcohol in the blood, greater is the overall elimination.

13.2.6 Effects

Alcohol affects the central nervous system in all amounts. Some persons are easily affected even by the low intakes. Other can tolerate large amounts before they show outward signs/symptoms. Alcohol affects the whole body, vision, hearing, speech are all affected. Speech becomes slurred, double vision occurs. Deterioration of judgment and self-control are the first/initial causalities.

Alcohol is a narcotic. That is, it depresses the body system. There is no minimum quantity, which does not affect the system adversely.

13.2.6.1 Euphoria

The observations of common people are different. They observe that when a person has taken a glass or two of beer, a glass of wine or one or two pegs of whisky, the subject exhibits euphoria. They, therefore, consider that a drink/alcohol is a stimulant. Extensive experiments

have proved that alcohol is never a stimulant. The euphoria shown after a moderate dose of liquor is due to the inhibitory cells of the brain (centres regulating conduct, judgment and self-criticism/control) are the first to be dulled by the narcotic, to reduce sensitivity and self-control. The effect is that the person feels:

1. Temporary relief from fatigue, pain or depression
2. A sense of well-being
3. Increased confidence
4. Less restricted speech
5. Carefree attitude

13.2.6.2 Muscular In-co-ordination

Muscular in-coordination (ataxia) due to alcohol intoxication results in jerky, un-coordinated movements of the limbs. There is postural instability, manifested by irregular wide-based gait.

Ataxia gait is dubbed as the drunken person's gait. It is clumsy, sway back and forth, and the subject falls down now and then. It is due to alcohol's effect on the brain's part controlling the movement.

Continued drinking causes affects the parts of the brain controlling inhibitions adversely and depresses the motor centres further. The results are apparent when a person has taken about two large pegs of whisky or four bottles of beer. The changes observed in the individual are:

1. **Inherent tendencies** of the individual become apparent. He may become hilarious, morose, irritable or excitable without proper cause.
2. **Neuromuscular** in-coordination occurs.
3. **Slurred speech** is common
4. **Staggering gait** (drunken person's gait: ataxia).

13.2.6.3 Respiratory Paralysis

If more liquor is consumed the paralysis of the respiratory centers sets in. The amount of alcohol to cause the effect varies with different individuals, depending upon the factors already mentioned. The effects observed are:

1. Complete in-coordination of muscles.
2. Stertorous breathing
3. Sleep
4. Coma; and
5. Death

13.2.7 Fatal Dose

Usually when the alcohol concentration in the body reaches the level of 0.40% or above it proves fatal. It has been found that 50% of the persons who have that level die. If alcohol causes vomiting, the latter may cause asphyxiation due to food going into the air passage. If asphyxiation does not occur, the expulsion of alcohol may save the individual.

The fatal dose of liquor for an ordinary adult person varies. In terms of alcohol, it is about 200 to 500 ml of absolute alcohol and about 50 ml onward for children under the age of twelve years. It means consumption of about three quarters of a bottle of whisky or about seven

bottles of beer onwards is fatal for an adult. The other factors, not already mentioned, which determine the effects of alcohol on a system, are:

1. The concentration of alcohol in the drink;
2. The time taken for taking a given quantity of alcohol
3. Mixing other narcotics in the drink
4. Habituation

If the drinking is spread over a number of hours and the drink has a small percentage of alcohol, the rate of intake and elimination is so adjusted that the body system does not attain the offensive concentrations. Consequently, the usual effects of heavy drinking will not be apparent.

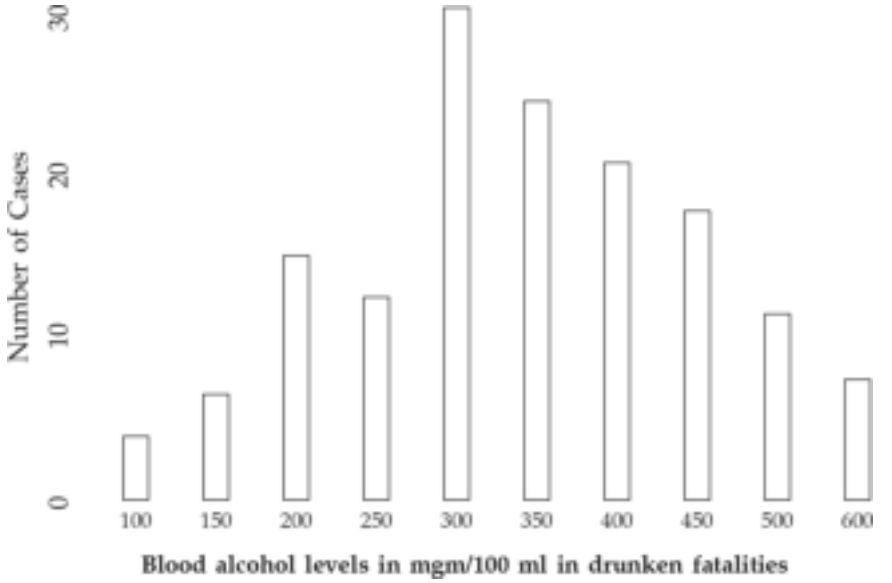

Fig. 13.2

13.2.8 Fatal Period

The fatal effects of alcohol may appear within 10 to 24 hours. However, in some cases, death may take place immediately or even after a number of days.

13.2.9 Alcoholic Allergy

Some persons are allergic to alcoholic drinks. The drinks madden them and they behave like maniacs under its influence.

13.2.10 Abnormal Tolerance

Alcoholic drinks affect all normal persons, though the tolerance varies from one individual to another. In rare cases, however, the drink does not affect a person appreciably. It is due to some either peculiar body tissues or sheer will power.

A very senior officer, who was a teetotaller, once related a personal experience. His friends asked him to drink half a bottle of whisky (about 375 ml) and drive a vehicle for about 25 km. He did it!

At another occasion, he was administered anaesthesia to carry out some operation, after an accident. The anaesthesia had no effect upon him. (CH)

13.2.11 Normal Use

In addition to alcoholic drinks, alcohol is used extensively as a solvent in industry and fuel in motor vehicles. It is an important solvent in most of the medical system in pharmaceutical preparations.

13.3 LOCATION AND COLLECTION

13.3.1 Illicit Liquor

Illicit manufacture is a flourishing industry in India, especially in states where prohibition prevails. Liquor stills are located at secret places. Covert observation and talks with the persons close to the suspected culprit reveal the locations. The paraphernalia and the products of manufacture are also secreted. The IO, therefore, searches all likely/unlikely places to locate the unauthorised stills and stores. In addition, he utilises the services of shadows and informers to locate them. Specially trained dogs also help to locate the stills/stores of illicit liquors.

Collection of the evidence includes the collection of the paraphernalia, fingerprints and tool marks in addition to the liquor and manufacturing ingredients.

13.3.2 Evidence of Intoxication

Intoxication may have to be established in cases of sudden deaths, in offences against the person, in motor vehicular accidents and in cases where diminished responsibility is claimed as a defence. The alcohol actually present in the brain causes intoxication as it is the alcohol, which affects the normal functions of a person. The blood alcohol is in equilibrium with that in the brain fluid. Therefore, the blood alcohol concentration is a fair index of the alcohol present in the brain. It is the material of choice for alcohol concentration determination. However, for practical reasons, breath, urine and saliva are also used. Breath, of course, has become the most convenient material as high precision instruments have come up in the field for breath alcohol analysis, which is sensitive, specific and rapid. The alcohol concentrations in all the body fluids at equilibrium are co-related to Blood Alcohol Concentration (BAC). The degree of drunkenness is expressed in terms of BAC. There are conversion factors, which convert the concentration of alcohol in a particular fluid into BAC.

BAC is the criterion used to determine drunkenness, all over the world. BAC is determined by chemical/instrumental tests for alcohol. It involves the following steps:

13.3.2.1 Collection Blood Samples

There are minor variations in alcohol concentration in the samples collected from various parts of the body. They are ignored. There is no prohibition, therefore, of taking blood from any part of the body, but usually, blood is collected from the ante-cubital vein of the arm. In the case of a dead person, venous blood from the leg can also be collected. The blood from the chest cavity is usually not collected as it is often contaminated by other body fluids.

While collecting blood samples, the medico-legal expert observes precautions and takes care to:

1. Allow only the qualified medical personnel to take blood samples in the presence of the investigating officer and witnesses.
2. Take two samples of blood, 5 ml each.
3. Preserve the samples with 100 mg. of sodium fluoride (1%) each.

4. Disinfect the skin (and the syringe needle) with non-alcoholic disinfectant, (mercury chloride solution) before taking the samples.
5. Use blood alcohol kits for the collection of the sample. The kit consists of:
   - Sterile disposable syringe
   - Blood collection tubes
   - Preservative; usual one is sodium fluoride
   - Mercury salts
   - Anti-coagulant (citrate, oxalate!). It obviates the need for homogenization
6. Use standard packing kit to pack the tubes after they have been labelled, sealed and witnessed.
7. Dispatch the blood sample to the laboratory at the earliest, observing legal formalities.
8. Store the blood it in a refrigerator at about 4° C if it has to be stored. 1% sodium fluoride or oxalate can keep the sample useable for about 6 months. The preservative and the anticoagulant do not interfere with the analysis.

Blood collection kits are convenient. They are being used routinely in blood testing laboratories. The kits are organised by the departments where blood sample collection is extensive.

13.3.2.2 Post-Mortem Blood Samples

Post-mortem blood from dead persons is collected at the earliest; in any case, before the putrefaction sets in or before the body is embalmed. If the body has started putrefying or is putrefied, the blood also suffers changes and the results of the analysis may be misleading. In such cases, cerebrospinal fluid or vitreous humour are collected as they are better test materials. Types of samples:

13.3.2.3 Urine Samples

The urine sample is easy to collect. However, it may not give true index of blood alcohol at the time of arrest as the urine may be accumulating for a long time in the bladder. Therefore, the bladder is emptied soon after the arrest. The sample urine is collected about half an hour thereafter. A second sample after another half an hour should suffice.

Whenever possible, a collection kit, on the pattern of blood collection kit is used. The urine is collected in disposable beakers and stored in screw type bottle instead of sample tubes.

The sample is sent to the laboratory at the earliest. If the sample has to be stored, 0.2% fluoride is used as preservative.

In case of female culprits, the urine sample is collected through female police official or another reliable female. The latter should witness the sample.

Urine sample is used only when blood samples cannot be obtained or the urine is used as an additional test material.

13.3.2.4 Saliva Samples

Saliva samples are not used many cases. They do not offer any advantage over blood, urine or breath samples. There are more or less of theoretical interest only. The subject is given paraffin for chewing. It causes salivation. The saliva is collected in a sterile tube. If it has to be preserved fluoride is used as in blood/urine samples.

13.3.2.5 Breath Sample

For accurate blood alcohol estimation from breath, only alveolar air[5] (alveolar gas) is taken into consideration. Alveolar air is the one, which is in immediate contact with alveoli of the lungs. It is in equilibrium with blood alcohol and contains amounts of alcohol, which correspond to blood alcohol. The breath also contains air, which is not in contact with the alveoli and hence dilutes it. The breath is, therefore, collected as given below:

1) Collect total exhaled gases. Assume that it is two-third alveolar air.
2) Or, assume exhaled gases contain 5.5% carbon dioxide and calculated the alveolar air on its basis.
3) Collect the last portion of the forced exhaled gases; assume it to be alveolar air.

The storage and collection of breath is done in many ways. The amount collected varies from less than one ml to about 200 mi of exhaled gases and vapours.

The collected sample is taken to the departmental laboratory at the earliest. If they are sent over long distances, the packing is properly done to avoid breakage or contamination.

Any one of the fluids can be used for analysis. However, in important cases, two fluids/ samples are collected. The fluids in the order of preference are blood, urine, saliva and breath.

If the samples are to be stored, they are kept under lock and key, preferably, in a refrigerator.

If a breath analyser is available, a preliminary test is made on the spot. Some modern instruments give directly accurate blood alcohol. One set of the samples is preserved in a refrigerator until the disposal of the case, as the defence may desire to get the same analysed from a chemist of their choice. In case the samples are to be examined at more than one place, an additional set of samples is collected for each place.

13.4 PROBLEMS

In crimes involving alcohol, the following types of questions need answer:

1. Does the given sample contain alcohol?
2. Is it illicit liquor?
3. What is the alcoholic strength of the liquor?
4. Does the liquor conform to the given specifications? Or, is it an imitation or a substitution of a given brand?
5. Were the drivers involved in an accident, under the influence of alcohol?
6. Did the person die of alcoholic poisoning?
7. Did the dead person consume alcohol before his death?
8. Was the person who claims diminished responsibility actually under the influence of alcohol?

Four persons consumed some alcoholic drink. Two of them were found dead in the hut, while the other two complained of pain in the stomach. They were taken to hospital. They also died after admission in the hospital. Ethyl alcohol and methyl alcohol were detected in viscera of all the four deceased and in the unconsumed portion of the liquor. (CH)

5. It is the gas in the pulmonary alveoli where exchange of oxygen or carbon dioxide occurs.

13.5 EVALUATION

The questioned sample of liquor is identified/and individualised by comparing its analytical data of with that of the standard data of the corresponding liquor. The following data is usually compared:

13.5.1 Identification of Liquor

Sometimes it is necessary to establish whether a given drink is liquor or not; i.e., whether it contains alcohol or not. This is established by identifying alcohol in the liquor. The following tests are employed for the purpose:

1. Iodoform test gives a characteristic smell.
2. Ester formation gives a fruity smell.
3. Determination of the boiling point, specific gravity and refractive index after purification identify alcohol.
4. Gas chromatography has become a very popular identification technique for alcohol.

13.5.2 Liquor Content

It is important to know the type of liquor it is. For this following determinations are carried out.

13.5.2.1 Alcoholic content

To find out the alcoholic content, The liquor is distilled in a specified manner and the distillate is collected. The specific gravity and refractive index of the distillate are determined. The concentration of alcohol is found from specific gravity or refractive index tables. Sometimes both determinations are used to arrive at the correct identification.

Other methods for the determination of alcoholic content have come up. The most convenient and efficient method is gas chromatography. Peak area relevant to alcohol gives the quantity of alcohol. Direct reading instruments, with integrators have also come in the field.

13.5.2.2 Specific Gravity

The specific gravity of liquor is affected not only by the alcoholic content but also by other ingredients of the liquor, especially sugars, unfermented cereals and spices.

The specific gravity is determined through hydrometers, pyknometer or with the help of a Westphal balance or with specific gravity bottles.

13.5.2.3 Refractive Index

The dipping type of refractometer is used to determine the refractive indices of liquors.

13.5.2.4 Total Solids

The total solids of liquor, notably of beers and wines, vary considerably depending upon the ingredients and the manner in which the liquor has been prepared. If the solids are more than 5%, they are estimated indirectly from the specific gravity. A given volume (say, 50 ml.) is distilled after determining its specific gravity. The distillate is then made up to the original volume and its specific gravity is determined. The total solids are given by:

$$\frac{S1 - S2}{0.00386}$$

Section 1 and section 2 are specific gravities of the liquor before and after distillation respectively.

When total solids are less than 5%, they are determined by evaporating 50 ml. of alcohol in a flat-bottomed dish. Final drying is carried out in a steam-heated oven at 100°C for two hours.

13.5.2.5 Acidity

Total acidity of wine is determined by direct titration of the liquor with alkalis. Usually barium hydroxide solution (0.1 N) is used.

The presence of carbon dioxide creates some difficulty in the estimation.

Volatile acidity is determined by distillation of the liquor and titration of the distillate. Usually tannin is added to the liquor before it is distilled.

Volatile acidity and total acidity are expressed in terms of acetic acid while fixed acidity is expressed in terms of tartaric acid.

13.5.2.6 Sugars

Sugars are detected and estimated by Benedict's methods. They may also be tested and estimated by polarimetry.

The determination of sugar content in wine is of great importance as it a significant constituent in the quality/taste of wine. It is now estimated through enzymatic analysis or through high performance liquid chromatography (HPLC).

13.5.2.7 Ash

The ash content of liquor is estimated by evaporating a given sample and ashing it in the usual way.

13.5.2.8 Miscellaneous

1. **Essential oils;** they are separated by diluting the liquor and extracting it with petroleum ether. They are identified by their smell, colour,
2. **Methyl alcohol** is detected by oxidation and estimated from the colour produced with Schiffs reagent. It is oxidized The products give the colour. Gas chromatography is however, is the preferred mode.
3. **Isopropyl alcohol** is estimated by its oxidation to acetone, which gives colour reaction with nitrobenzaldehyde.
4. **Glycerol, furfural, sulphate, sulphite, lead and arsenic** are also sometimes detected and identified. They are tested through chemical/physical tests.

Instrumental methods have made most of the traditional chemical/physical techniques obsolete. For example, gas chromatography can analyse both qualitatively and quantitatively all the volatile constituents of liquors; methanol, ethanol, higher alcohols, esters, acids, ketones, aldehydes, essential oils and furfural. Likewise, spectrography, atomic absorption spectrophotometry and other techniques can analyse metallic constituents.

Complete analysis of a liquor can, thus, lead to its identification and prove whether it is illicit/licit/standard/spurious. It also permits identification of individual liquors and their sources.

13.6 INTOXICATION

Alcohol intoxication (or drunkenness) is a physiological state in which a person's normal capacity to act or reason is inhibited by alcohol.

Alcohol on ingestion enters the bloodstream at a faster rate than it is eliminated through various routes. It affects the human brain (and other part of the body), his psychology, reasoning, consciousness and control over body functions. The effects represent intoxication. An **intoxicated** person is incapable of acting, as an ordinary prudent and cautious person, not drunk, would act under similar conditions. He is incapable of properly executing the occupation in which he is engaged at the material time.

Intoxication is an important factor in many criminal/civil cases.

Alcohol intoxication is identified by medical examination, physical tests and blood alcohol analysis. The last includes chemical, biological and instrumental techniques of the body fluids.

13.6.1 Medical examination

In medical examination, the examiner checks the symptoms of drunkenness and also makes the subject to perform certain actions. The doctor or a police officer checks the following symptoms:

1. **Breath smell;** it is a good guide in some cases. Certain liquors, though taken only in small amounts, emit a strong smell, while other liquors, though consumed in large amounts, may not give the characteristic odour.
2. **State of clothing;** a person under the influence of alcohol is careless about his dress and it is dishevelled.
3. **General demeanour;** an intoxicated person may show flushed face, reddened eyes, reduced inhibition, disorderly behaviour in talk and action,
4. **Speech;** slurred speech is an indication of intoxication. It is difficult for an intoxicated person to pronounce certain words. Certain drugs also cause slurring of speech.
5. **Clean tongue**/excessive salivation indicate intoxication.
6. **Eyes;** the pupils of an intoxicated person are often dilated. The reaction to strong light is slow. The eyes are red and have a glassy vacant look.
7. **Walk;** an intoxicated person has a staggering gait. It is more prominent when he is turning at sharp corners.
8. **Memory;** an intoxicated person has a short memory, especially of recent events. The time taken by him to recall an event is long. He may also show some confusion. He loses sense of time.
9. **Breathing:** The subject may show hiccups in some cases.
10. **Tremors;** hands, arms, feet and legs may develop tremors.
11. **Coma.** Heavily drunk person may go into a coma. Most of the persons go into coma when they have imbibed alcohol to give Blood Alcohol Concentration (BAC) 0.35% or above.

It may be noted that:

1) Reliance is not placed on a single observation.
2) The pathological condition of the subject is also checked. The subject may be suffering from some disease. Thus, red eyes, dilated or contracted pupils, tremors or rapid pulse may be due to some disease.
3) Some persons are capable of consuming large amounts of alcohol without showing any outward sign of drunkenness. They may be able to repeat certain words and phrases or to write neatly. They may be able to walk in a straight line.

Thus, elimination of drunkenness is not based on such tests. BAC, beyond the legal limits, is the sole sure test of drunkenness or otherwise.

13.6.2 Physical Tests

The Investigating officer himself carries out the physical tests. They are good preliminary indicator tests when it is not possible to get a medical examination done or to determine BAC. Physical efficiency check of the subject includes the following tests:

1. Walk in a zigzag path.
2. Pick up small items fallen on the ground.
3. Perform simple mental mathematical calculations.
4. Write quickly.

The habitual drinkers can do these activities even after drinks.

13.6.3 Blood Alcohol Analysis

The presence of alcohol in the blood of a person affects the Central Nervous system (CNS) to create a state of intoxication. The greater the amount of alcohol, the greater is the intoxication. It is, therefore, ideal if intoxication and the BAC in the body are co-related. The importance of the relationship was recognised in the far end of the last century.

A lot of research on the subject has given a clear picture of the relationship of alcohol concentration in the body and intoxication. Consequently, the estimation of BAC in body fluids has acquired tremendous importance. Excellent techniques are available now, by which the alcohol level in body fluids can be determined. These techniques are classified as:

1. Chemical Techniques
2. Bio-chemical Methods
3. Instrumental Methods
4. Miscellaneous Techniques

The detailed discussion of these techniques is beyond the scope of this book but a brief description is given below. Those who need details may refer to the easily accessible Forensics literature in books/journals/Internet.

13.6.4 Chemical test

In all chemical tests, the advantage is taken of the fact that an oxidising agent easily oxidises alcohol to give acetic acid. Commonly used oxidisers are potassium dichromate and sulphuric acid, potassium permanganate solution or osmic acid. The commonest oxidising agent used is potassium dichromate. A measured amount of oxidising agent is added to the measured amount of liquor. Part of the oxidising agent is used to oxidise the alcohol. The agent left unused by alcohol is found out. The used oxidising agent gives the amount of alcohol present in the sample.

The first person to suggest this technique for the estimation of alcohol was Nicloux. Others have since modified it. Notable modifications are due to:

1. Widmark
2. Cavett
3. Southgate and Carter, and
4. Kozelka and Hine

These modifications give fairly accurate and reproducible results. Out of these techniques, Cavett's modified method and Kozelka and Hine's methods are still used in India in some laboratories[6].

Tests for adventitious materials such as acetone, albumin, salicylates, phenols, sugars and preservatives are also carried out. The above technique for alcohol determination is modified to avoid interference by these materials.

The chemical methods are non-specific because other reducing agents (other alcohols, aldehydes, Ketones), if present are also oxidised, corrupting the result unless they are taken into consideration. The methods, therefore, are giving way to other methods, notably to instrumental methods.

13.6.5 Gas Chromatography

Gas chromatography technique for the determination of alcohol in body fluid is extremely simple both in principle and operation. Yet it is highly sensitive, rapid and specific. It needs only small quantities. The analysis is not interfered by the common materials present in the sample. Gas chromatography, consequently, is being used extensively and increasingly for the body fluid alcohol determinations in almost all laboratories. The set up of the process is shown in the diagram below:

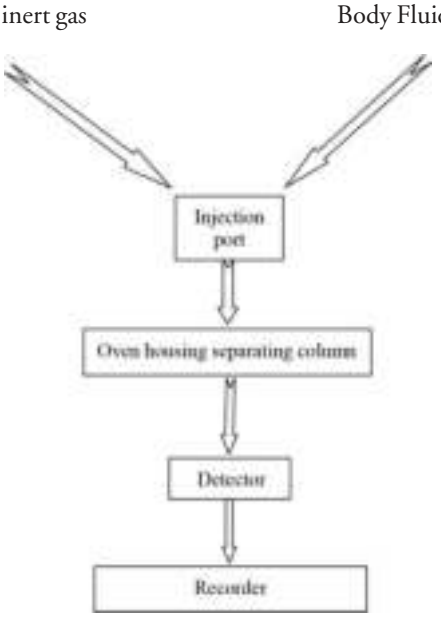

Fig. 13.3

Flow-chart: Gas Chromatography

6. In Cavett's modified method about 2 ml. of blood or urine are taken in a petri dish. It is placed over 10 ml. of potassium dichromate solution (4.9 g of dichromate in 1 litre of 50% sulphuric acid) over a triangular glass stand, in a wide mouthed 500 ml. jar. The jar is closed with a ground glass plate and a screw-on cap. It is left for about 20 hours at room temperature or incubated at about 37° C for 8 hours.

   The alcohol in the sample is distilled over by hygroscopic action of sulphuric acid. It gets oxidized on coming in contact with the solution. An excess of potassium iodide is added to unused dichromate solution. The solution is titrated with sodium thiosulphate solution using starch as the indicator. The quantity used for alcohol is thus found out.

   Often, it is preferable to use Kozelka and Hine method when interference by reducing agents is suspected. The main features of the Kozelka and Hine technique are:
   1. The distillation and oxidation are carried out in separate steps.
   2. Foaming is avoided in the distillation by precipitating proteins with the addition of sodium tungstate, to the blood sample. A trap is also employed to prevent froth being carried over to the distillate.
   3. Reducing agents are retained in mercuric chloride and sodium hydroxide solutions.

A measured sample containing alcohol is put into the head of the column (injection port) kept in a heated chamber where it is changed into vapours. The vapours are carried by carrier gas through a column packed with a suitable material. Due to differential adsorption, various constituents of the sample are separated. They are detected through a sensitive detector. The time intervals at which they pass through the detector are recorded on a chart (chromatogram of the sample) which gives qualitative and quantitative analysis. Blood, urine or other body fluids are diluted with isopropyl alcohol before analysis.

Head space procedure for the analysis of alcohol is becoming popular. In this technique body fluid liquid is mixed with an internal standard (say Dioxane) and allowed to attain equilibrium in a rubber bunked closed tube, when one ml. sample of the vapours is drawn with a syringe and injected into the injection port and the sample undergoes chromatography. A typical instrumental set up is:

1. Column: Stainless Steel, 2 mm x 3 m. Coated with Carbowax.
2. Temperature:
   - Injection port 175° C
   - Oven 80° C
   - Dilutor 225° C
3. Carrier Gas Helium
4. Detector FID/TCD

Other alcohols, esters, aldehydes, ethers, acids and essential oils appear at different intervals and have separate peaks. They, therefore, not only do not interfere in the analysis but they are also identified and estimated.

13.6.6 Biological Method

This method utilizes the action of an enzyme, alcohol dehydrogenase (ADH) which changes alcohol into acetaldehyde by removing a molecule of hydrogen. Acetaldehyde is then estimated spectrophotometrically (340 nm).

The enzymic reaction is carried out in a buffer solution of about 9 pH in the presence of semi carbazide. The coenzyme gets reduced and changes the absorption quantitatively. Alcohol is transferred to the solution by suction. The enzyme reacts only with alcohol and does not react with acetone or methanol.

The technique is sensitive, specific and micro in nature.

13.6.7 Breath Analysers

A large number of instruments are available for the analysis of breath alcohol in the market under various trade names, namely drunkometer, breath analyser, alcometer, intoximeter and, the latest (A.L.E.R.T.) Alco Testor, They are extensively used in United States of America. They are not so popular in other countries. However, their portability, simplicity and the instantaneous results they produce have made them very popular especially in checking drunken driver. They are becoming indispensable where the intoxicated driver is a serious problem. Research and experience have brought in tremendous improvements in these instruments.

Most of the instruments work on the principle that the alcohol contained in breath is oxidised by an oxidising agent and produces change in its colour, which is measured visually, colourimetrically or spectrophotometrically. The change in colour is proportional to the amount of alcohol. The latter, therefore, can be determined from the former.

Newer instruments are also using other estimation technologies. The important technologies are:

Semi-conductor oxide-based testers; these breath analysers are relatively new and cheap. An ethanol-specific sensor is used to measure the subject's BAC.

Semiconductor oxide sensors are cheap, power consumption is low and they are of small size, hence portable. Semiconductor oxide testers require frequent calibration (yearly or after about every 300 tests). For low-volume work, they give accurate and satisfactory performance.

Fuel cell testers; they are high accurate and sensitive. Being of small size, they are portable. They need re-calibration after about 1000 tests or yearly.

In a fuel cell alcohol is oxidises (a chemical reaction). The reaction creates an electrical current. The strength of the current is proportional to the amount of alcohol. The measure of the current determines the subject's BAC.

Spectrophotometer technology; It is used in tabletop breath analysers. Spectrophotometers identify alcohol through absorption of infrared light. The absorption level is measured in the singled out alcohol sample and measured, The level gives the subject's alcohol level.

Some breath analysers are used only to screen drivers. They indicate whether the person is legally sober, drunk, It is indicated usually by various types of light or word 'PASS', 'FAIL' or 'WARN' which appear upon the instrument. Some instruments give BAC on a print out.

13.7 SIGNIFICANCE OF BLOOD ALCOHOL CONCENTRATION

13.7.1 Legal Drunkenness

As alcohol in blood in all concentrations adversely affects the human brain, mind and body, there is no safe lower limit. However, some countries have arbitrarily fixed blood alcohol concentration limit to identify drunkenness. The prescribed limits in some countries are:

Table 13.2

S. No.	Country	Limit
1	United Arab Emirate and Romania	0.0%
2	Australia, South Africa and Germany	0.05%
3	The United Kingdom, United States of America and New Zealand	0.08%
4	**India**	0.03%

The medical tests are often unreliable to determine intoxication, the determination of BAC in body fluids is therefore, the sure indicator of drunkenness is used. Most of the countries use it for legal purposes.

13.7.2 Estimation of ingested alcohol

The estimation of alcohol consumed by a person is useful to determine if the person is legally drunk or not. There are numerous formulae. The one given below is simple and good indicator.

Q = C.W.B.

Q = Total quantity of alcohol consumed.

C = Concentration of alcohol in the blood.

W = Weight of the body, and

B = The body factor.

The use of body factor is necessary to account for the non-absorbing part of the body, mainly the bones and the fat. B is roughly 0.7. The body factor for males has been found to be about .68 and for females .55, in U.S.A. It will vary with the geography of the lands and their inhabitants.

Thus, a person weighing 70 kilograms and having an alcoholic concentration of 0.1%, have consumed alcohol:

$$Q = \frac{0.1 \times 70 \times 1000 \times 7.0}{100}$$

$$= \frac{700 \times 7}{100}$$

$$= 49 \text{ g}$$

$$= 62 \text{ ml (SG = .7893)}$$

In terms of whiskey, the person has consumed about 150 ml. of whiskey or over two large pegs of whiskey. In terms of beer, the person has taken two to four bottles of beer.

As discussed earlier, the elimination of alcohol starts as soon as it is absorbed. The correct amount of alcohol in the body will be less and it can be found out. For example, in the above case if the total time taken for drinking and delay in taking the sample is three hours, then:

$$\text{Alcohol eliminated} = 3 \times 0.015$$

$$= 0.045$$

Imbibed alcohol = 0.10 (from the above calculations)

$$\text{Residual alcohol in the body} = 0.10 - 0.045$$

$$= 0.055$$

13.7.3 Concentration of Alcohol in body fluids

As estimation of alcohol in the body is determined not only from blood but from other fluids also, it is essential to know the concentration relationship in the fluids *inter se*. The table below shows the interrelationship of concentrations.

Table 13.3

Co-Relation of Alcohol in Blood and Body Fluids	
1. Blood : Urine	= 1: 1.33
2. Blood : Perspiration	= 1: 1.1
3. Blood : Saliva	= 1: 1.1
4. Blood : Breath	= 2100:1
5. Blood : Brain Fluid	= 1: 0.85
6. Blood : Liver	= 1: 0.77
7. Blood : Plasma	= 1: 16

Other body fluids do not give consistent results.

The ratios will vary somewhat with the technique of sampling. For example, if the breath is not exhaled properly from the lungs, the concentration of alcohol in breath is found less. Likewise, if the mouth contains some alcohol, the concentration of alcohol in breath is more.

Similarly, if urine is not sampled properly, the concentration of alcohol in urine will not be a true index of blood alcohol level at the time of taking the sample, if there was urine in bladder when he started drinking.

13.8 PRESENTATION

The reports of chemical examiners who carry out blood alcohol analysis are tendered in the Trial Court under section 293 of the Code of Criminal Procedure, 1973. Thus, attendance of the examiner in a court is not compulsory.

The evidence is highly technical and is not likely to be understood by the courts. It is therefore, necessary that the expert should explain the nature of evidence in person whenever possible. It is recommended that the following chart should accompany each analysis report concerning intoxication.

Table 13.4

Alcohol Effects

	Liquor	Taken	Concentration %		Effects
Beer Bottle (5%)	Whisky (ml)	Alcohol (ml)	Blood	Urine	Signs/symptoms
Half- 1 bottle	35 70	15 30	0.025 0.050	0.033 0.07	Outwardly no effect Inhibitory centres affected Mild euphoria.
2-4 bottles	140-280	60-120	0.10 to 0.20	0.133-0.236	Muscular in-coordination. Subject talkative, social, happy. Judgement impaired. Efficiency decreases. In some confusion.
4-6 bottles	280-450	120-180	0.2-0.3	0.267-0.400	Emotional breakdown, Mental physical incoordination. Muscular in-coordination increases slurred speech, staggering gait, loss of pain perception and other sensation (complete confusion).
6-8 bottles	420-560	180-240	0.3-0.4	0.4-0.533	Loss of muscular control complete. No response to stimulations, Loss of consciousness. Stertorous breathing, sleepiness, Coma, Stupor, Death.
Above	>560	>240	>0.400	>0.533	Coma, Sleep, Paralysis, Death.

The elimination of alcohol starts immediately after the start of drinking, at the rate of 10 ml. of pure alcohol per hour. If a person has taken two bottles of beer in 3 hours, 30 ml. of alcohol is eliminated during the drinking and at the end effective concentration is only 0.05% instead of 0.10%.

There are numerous techniques for BAC determinations. Besides they are being changed/modified continuously. It is therefore imperative that the technique employed is mentioned in the report. The technical details should be given only in brief but reference to detailed method should be given, so that if the court so desires, can verify the dependability of the procedure.

13.9 CASE LAW

Supreme Court Cases – 21st Century

13.9.1 Spurious Liquor Deaths[7]

Author's Summary

The lust for liquor and poverty push the weaker section of the society to the money sharks who, to make fast buck, sell spurious killer substitutes.

The present case is such a tragedy on a vast canvass in Kerala. **31** persons lost their lives, **6** persons suffered total blindness whereas more than **500** persons suffered serious injuries on account of the drinking of the spurious liquor.

Supreme Court

"…we must note some very disturbing facts which have been revealed from the voluminous evidence by the prosecution. Here was a person who was unabashedly running his empire of spurious liquor trade and for that purpose had purchased politicians including the public representatives, police officers and other officers belonging to the Excise Department."

Highlights italicised

Relevant Extracts (Verbatim)

4. Alcohol has already proved itself to be one of the major enemies of the human beings. However, its grip is not loosened in spite of the realisation of the evil effects of alcohol on the human life. On the other hand, the unholy grip is being tightened day by day. Therefore, when the standard and healthy alcohol in the form of liquor is not available or is too costly for a common man, the poor section of the society goes for illicitly distilled liquor which is sold by the bootleggers. The conscienceless bootleggers—thanks to their avarice for money—take full vantage of this human weakness and without any compunction or qualms of conscience, distil illicit liquor and then to increase the sale and to gain astronomical profits make their product more potent at least in taste so as to attract the poor customers. Such poor customers invariably become the prey of such unholy avarice on the part of the bootleggers and in the process even lose their lives at times or suffer such injuries which are irreparable like total blindness, and that is precisely what has happened in this case.

5. On 22 October 2000, in the wee hours, Sub-Inspector of Police, Parippally received information that one Raghunatha Kurup of Kulathoorkonam and seven others were admitted in the Medical College Hospital Thiruvananthapuram for treatment on account of illness caused by consumption of illicit liquor. He reached the hospital and recorded the first information statement of Raghunatha Kurup at 2 am. By that time, one Sasidharan who had consumed the illicit liquor had died and two others were lying in unconscious condition. On that basis, Sub-Inspector registered Crime No. 268 of 2000 under sections 302, 307, IPC read with section 34, IPC and under section 57A of the Abkari Act. Little did he know the exact ramifications or vastness of the grim tragedy which was about to take place. Three other similar crimes were registered at Kottarakkara police station and this was followed by further crimes registered in the same police station being Crime No. 809 of 2000, Crime No. 810 of 2000, Crime No. 811 of 2000 and Crime No. 817 of 2000. All these crimes were consolidated with crime No. 268 of 2000 of Parippally police station and the information started trickling regarding the consumption of spurious liquor by poor persons and their admittance to the hospital from within Anchal and Parippally police station limits. Similar incidents had taken

7. *Chandran @ Manichan @ Maniyan v State of Kerala*, AIR 2011 SC 1594 : (2011) 5 SCC 161.

place within the limits of Mangalapuram police station and the crime was registered there also. Investigation machinery quickly responded to the happenings and

a Special Investigation Team (SIT) was constituted as per the directions of Director General of Police, Kerala, Thiruvananthapuram on 25 October 2000 which was to be headed by Shri Sibi Mathews, IPS who was the Inspector-General of Police. He was to head the team of seven persons, six other persons being the police officers of the level of Inspectors and above. All these earlier mentioned crimes were taken over for investigation by SIT. They started investigation in all the concerned police stations where the crimes were reported. It was realized that as many as 31 persons had lost their lives, six persons had suffered total blindness in Kollam District whereas more than 500 persons suffered serious injuries on account of the drinking of the illicit liquor.

6. Unfortunately, all this was going on in God's own country, Kerala which was turned into hell by the liquor mafia. Eventually, an investigation by the SIT was completed and

> *the final report was filed before the Judicial Magistrate, 1st Class, Paravoor on 21 January 2001 against 47 persons. After the charge-sheet was filed, accused No. 48 was also added by a supplementary charge-sheet. However, as many as four accused persons, they being accused Nos. 34, 36, 39 and 45 died on account of consumption of their own medicine, the spurious liquor. Accused No. 3 had lost his eye sight completely. Few accused were absconding, their cases were split up. Rest of the accused were sent for trial before the Sessions Judge before whom a marathon trial took place wherein 271 witnesses were examined, as many as 1105 documents were proved and relied upon and over 291 material objects were produced. The defence also examined as many as 17 witnesses and relied on 110 documents being Exhibits D-1 to D-111.*

7. The prosecution alleged that methyl alcohol which is a poisonous substance used to be brought from Karnataka and mixed with Ethyl alcohol. At times, this concoction was mixed with toddy and other essences resulting in a drink called Kalapani. The methyl alcohol used to be mixed with ethyl alcohol which was also illegally and illicitly procured in order to add potency to the drink so that more and more people would purchase the same. These sales were made from the regularly licensed toddy shops and from other places. There was well-oiled machinery, huge in proportion, the main component of which was Chandran (accused No. 7) who was a toddy contractor. His brothers, Manikantan (accused No. 4) and Vinod Kumar (accused No. 8) were deputies helping him. This group had servants like Balachandran (A-15), the Manager. Even their wives did not lag behind. There were laboratories, assistants and labourers. There were drivers and a fleet of vehicles which were used for importing methyl alcohol from Karnataka and then it used to be brought to the laboratories maintained by Chandran (A-7), Manikantan (A-4) and Vinod Kumar (A-8) where the mixing used to take place. Accused Nos. A-4 (Manikantan @ Kochani), A-7 (Chandran @ Manichan), A-8 (Vinod Kumar), A-15 (Balachandran), A-18 (Usha), A-19 (Sugathan), A-20 (Vijayan), A-21 (Rassuludeen), A-22 (Suresh @ Sankaran) and A-23 (Binu @ Monukuttan) were active in firstly procuring the methyl alcohol and then mixing the same in the laboratories and then distributing the same in the whole district, more particularly, to the various outlets for sale of toddy.

Chandran (A-7) used to control these shops which were either in his name or some other names. It was alleged by the prosecution that all these accused persons hatched a criminal conspiracy in or about March, 2000 prior to the auction of toddy shops for the period between 2000–01 and well-oiled machinery was created for importing methyl alcohol from a place called Arihant Chemicals, Bangalore. Chandran (A-7) controlled toddy shop Nos. 1 to 26 of Chirayinkil Panchayat so that there were easy outlets available for the sale of spurious liquor. Once methyl alcohol was imported, it used to be brought to the huge laboratories constructed for that purpose and carefully concealed which was located at Pandakasala.

It was alleged by the prosecution that Gunasekharan (A-17) purchased two barrels of methyl alcohol as part of the criminal conspiracy from Arihant Chemicals, Bangalore and the same was

entrusted to Anil Kumar (A-16) for import to Kerala for the purpose of its mixing with the spirit ethyl alcohol and for sale by Manikantan @ Kochani (A-4), Chandran @ Manichan (A-7), Vinod Kumar (A-8), Balachandran (A-15), Usha (A-18), Sugathan (A-19), Vijayan (A-20), Rassuludeen (A-21), Suresh @ Sankaran (A-22), Binu @ Monkuttan (A-23). It was brought by Anil Kumar (A-16) in a Fiat car which had a fake registration number. This Fiat car was fitted with a secret tank and thus the poisonous methyl alcohol was imported and was mixed with 56,200 litres of spirit which was also imported to Kerala by Mahesh (A-12), Salil Raj (A-13), Ashraf (A-14) and Sakthi (A-48). All the mixing was done at Pandakasala and then it was given for distribution to Manikantan (A-4) who transported it through Anil Kumar (A-5), Shibu (A-6), Santhosh @ Kochu Santhosh (A-9), Santhosh @ Valiya Santhosh (A-10), Mohammed Shaji @ Shabu (A-11), knowing it to be injurious to health, through various other vehicles.

8. The said methyl alcohol which was mixed in the Pandakasala godown meant for toddy shop Nos. l to 26 of Chirayinkil Panchayat and then got distributed by the above accused persons who all knew very well that it was injurious to health and was fatal. For this purpose, cars bearing registration No. PY01M-6582 and TN-1-rule 9283 and a Van bearing registration No. KLOQ-2787 were used.

9. It was further the case of the prosecution that from this poisonous spirit, 35 litres were taken in a car bearing registration No. TN-1-rule 9283 on 20 October 2000 at about 3.30 pm with the assistance of Anil Kumar (A-5) and Shibu (A-6) and was given to Herunnesa (A-1), Rajan (A-2) and Raju @ Mathilakom Raju (A-3) in the house of A-1 and A-2 at Kalluvathukkal. It was alleged that accused Nos. 1, 2 and 3 diluted the spirit by adding water and sold it through their outlets because of which 18 persons died due to consumption of spurious liquor. It was pointed out that two persons lost their eyesight and number of others sustained grievous injuries. It was further alleged in the charge that Manikantan (A-4) with the help of Anil Kumar (A-5) and Santhosh (A-10) transported 10 Kannas full of spurious liquor having a capacity of 35 litres in the car bearing fake registration No. KL 01M 7444 on 20 October 2000 night to Charuvila Puthen Veedu, Anthamon Muri and Kalyanpuram village at Kottarakkara and there the said liquor was sold by A-30 with the assistance of A-31 who earlier diluted the spurious liquor by adding water at the house of A-30 and packed liquor in polythene covers containing 100 ml each. The said pouches were also sealed with the help of sealing machine. Then the pouches were loaded in one Maruti car on the same day and the same was entrusted to A-39, Latha Kumari. Even these accused knew the spurious nature of the liquor and its lethal effects. Some liquor out of this was sold to one Soman Pillai and CWs. 630 to 634 and on that account Latha Kumari and Soman Pillai died while others suffered serious injuries.

18. Section 2(6A) of the Act defines "arrack". It means any potable liquor other than toddy, beer, spirits of wine, wine, Indian made spirit, foreign liquor and any medicinal preparation containing alcohol. Section 2(8) defines "toddy" to mean fermented or unfermented juice drawn from a coconut, palmyra, date or any other kind of palm tree. Section 2(9) speaks about the "spirits' meaning any liquor containing alcohol and obtained by distillation. Sub-section (10) provides the definition of "liquor" which includes spirits of wine, arrack, spirits, wine, toddy, beer and all liquid consisting of or containing alcohol. Section 2(12) defines country liquor which means toddy or arrack while section 2(13) defines foreign liquor which includes all liquor other than country liquor. Thus, it will be seen that "liquor" is the broadest concept and engulfs all the intoxicating drinks … … …

A new section was added by Amendment Act No. 21 of 1984 being section 57A which is the most relevant section for our purpose. The section reads as under:—

"57A. For adulteration of liquor or intoxicating drug with noxious substances,—(1) whoever mixes or permits to be mixed any noxious substance or any substance which is likely to endanger human life or to cause grievous hurt to human beings, with any liquor or intoxicating drug shall, on conviction, be punishable.

(i) if, as a result of such act, grievous hurt is caused to any person, with imprisonment for a term which shall not be less than two years but which may extend to imprisonment for life, and with fine which may extend to Rs 50,000;

(ii) if, as a result of such act, death is caused to any person, with death or imprisonment for a term which shall not be less than three years but which may extend to imprisonment for life, and with fine which may extend to Rs 50,000;

(iii) in any other case, with imprisonment for a term which shall not be less than one year, but which may extend to ten years, and with fine which may extend to Rs 25,000.

Explanation.—For the purpose of this section and section 57B the expression 'grievous hurt' shall have the same meaning as in section 320 of the Indian Penal Code, 1860 (Central Act 45 of 1860).

(2) whoever omits to take reasonable precautions to prevent the mixing of any noxious substance or any substance which is likely to endanger human life or to cause grievous hurt to human beings, with any liquor or intoxicating drug shall, on conviction, punishable—

(i) if as a result of such omission, grievous hurt is caused to any person, with imprisonment for a term which shall not be less than two years but which may extend to imprisonment for life, and with fine which may extend to Rs 50,000;

(ii) if as a result of such omission, death is caused to any person, with imprisonment for a term which shall not be less than three years but which may extend to imprisonment for life, and with the fine which may extend to Rs 50,000;

(iii) in any other case, with imprisonment for a term which shall not be less than one year but which may extend to ten years, and with fine which may extend to Rs 25,000.

(3) whoever possesses any liquor or intoxicating drug in which any substance referred to in sub-section (1) is mixed, knowing that such substance is mixed with such liquor or intoxicating drug shall, on conviction, be punishable with imprisonment for a term which shall not be less than one year but may extend to ten years, and with fine which may extend to Rs 25,000.

(4) notwithstanding anything contained in the Code of Criminal Procedure, 1973 (Central Act 2 of 1974), no person accused or convicted of an offence under sub-section (1) or sub-section (3) shall, if in custody, be released on bail or on his own bond, unless—

(a) the prosecution has been given an opportunity to oppose the application for such release, and

(b) where the prosecution opposes the application, the Court is satisfied that there are reasonable grounds for believing that he is not guilty of such offence.

(5) Notwithstanding anything contained in the Indian Evidence Act, 1872 (1 of 1872)—

(a) where a person is prosecuted for an offence under sub-section (1) or sub-section (2) the burden of proving that he has not mixed or permitted to be mixed or, as the case may be, omitted to take reasonable precautions to prevent the mixing of, any substance referred to in that sub-section with any liquor or intoxicating drug shall be on him;

(b) where a person is prosecuted for an offence under sub-section (3) for being in possession of any liquor or intoxicating drug in which any substance referred to in sub-section (1) is mixed, the burden of proving that he did not know that such substance was mixed with such liquor or intoxicating drug shall be on him."

30. *The reason why accused No. 7 had to mix the methyl alcohol and/or methanol is not far to see. It is clarified from the evidence of PW-96, V. Ajith Kumar that A-7 had put the bid of Rs 4 crores for the 26 toddy shops and even if all the toddy shops had worked in their full capacity he could not*

have recovered even half the amount and it was, therefore, that this idea of bringing ethyl alcohol, mixing it with methyl alcohol and creating various drinks like Kalapani, was mooted. The result thereof was for all to see which resulted in death of 31 persons.

The High Court has correctly observed that the basic reason for bidding for 26 shops for toddy was to get the legitimate godown for toddy. It is proved that those godowns, instead, were used not for storing toddy but for storing ethyl alcohol and mixing it with methyl alcohol for making enormous profits. It is not as if A-7 was selling only toddy. In addition to that he was creating various drinks preferably by mixing ethyl alcohol with methyl alcohol. Thus, there was a full liquor industry going on under his captainship.

31. *The last nail in the coffin is the evidence of PW-53, Sunil. We have very carefully gone through his evidence and the High Court has also extensively dealt with his evidence. PW-53 is a close relative of A-7 and worked in the godown from March, 2000. Before that he was supplying spirit to A-7 from various places. He has graphically described in his evidence as to how the spirit business was being done inasmuch as he deposed that the spirit used to be brought from the tankers and used to be collected in the syntex tanks and was filled in 35 litres cans.*

This spirit was used for making a drink called Kalapani by mixing with essence and some toddy. It was then filled in the cans and dispatched in the vehicles. The evidence of this witness further goes on to show the position of godown which was used for the storage of ethyl alcohol and methyl alcohol. He referred to methyl alcohol as 'essence'. He described that the spirit was brought from Karnataka and essence used to come on Thursdays in a white Fiat car. The Fiat car had a secret chamber. That car was identified as M.O. 24. The tank and the platform were built in the back seat and the front seat of the car. There were three valves attached to the same and 35 litres of methyl alcohol *i.e.,* the essence could be carried in the said car. He gave a graphic description of mixture with the spirit which ultimately was sold. He specifically named A-20, A-22, A-23 and A-21 who were supervising the mixing. In his evidence he has also specifically referred that he had seen M.O.-24, the car, importing the essence *i.e.,* the methyl alcohol precisely two days prior to the liquor tragedy. He has also named A-16 and another boy who were the occupants of the said car. He also suggested that he and the other employees were filling up the essence in 10 cans. The High Court has referred to the further evidence on the part of this witness that in the night at about 10.30 pm the tanker lorry came with spirit and the said spirit was filled in the syntex tank and cans. Those half-filled cans were then filled with the methyl alcohol meaning thereby it was mixed. He then went on to depose that the employees of A-4, namely, A-5, A-6, A-9 and A-10 came there with three vehicles and essence and they mixed up the essence with the spirit. He claimed that in all 60 cans were filled up and were dispatched in three cars for transporting to various places for sale. According to him he came to know about the Kalluvathaukkal tragedy on 21 October 2000. On that day at about 7.30 pm. A-7 and 15 came and slapped Vijayan for not properly mixing and A-7 then left the place telling them to destroy the evidence. According to him, thereafter, what was left in the syntex tank was poured in the river, un-used cans were removed and plastic covers were disposed of by setting fire. A-7 had also taken adequate care to send away the employees for some time and it was through him that the witness came to know that people had died by drinking the spirit supplied by A-4 and his employees due to a mistake in mixing by A-20 and A-22.

59. Before we part with this case, we must note some very disturbing facts which have been revealed from the voluminous evidence by the prosecution. Here was a person who was unabashedly running his empire of spurious liquor trade and for that purpose had purchased politicians including the public representatives, police officers and other officers belonging to the Excise Department.

The trade was going unabated. Unfortunately, it is the elite of the society or the "haves" of the society who never purchase this kind of spurious liquor for the obvious reasons. It is only the poor section of the society which becomes the prey of such obnoxious trade and ultimately suffers. As many as 31 persons have lost their lives, about 5 or more persons have lost their eye-site forever and several others have suffered in their health on account of the injuries caused to them. It is only by an accident that the mixing was not done properly on the fateful day in the sense that the liquor mixed did prove to be fatal or injurious. But that does not mean when it was mixed on other day for months together that it was not injurious.

The use of methanol was a dangerous proposition. It only shows that the human avarice could create hell in God's own country Kerala. We are not only perturbed by the enormousness of the tragedy but the enormousness of the liquor trade run by A-7 and that was under the so-called vigilant eyes of those who had a duty to stop it. The avarice is not only on the part of the accused persons, but also on the part of those who benefit from this horrible business. Though 10 years have passed, the reverberations of this grin tragedy have not become silent. We hope and expect that the Kerala Government takes up this issue and takes definite steps for overhauling the system. We are worried about the rotten system that allowed such trade not only to continue, but to thrive. It will be, therefore, for the administrators and the Government to take positive steps, firstly, to overhaul the system by weeding out the corrupts by punishing those who are responsible for the whole system looking sideways. We do not know as to whether such an exercise is taken up, but if it has not been taken up the government is directed to take such steps. We do not think that the things would come under control unless such exercise is taken, so as to save the poor man from such ghastly disaster.

13.9.2 Oral Evidence of Expert not Obligatory[8]

Author's Summary

In this case, the police seized 18 cartons of liquor. Representative samples were sent to Excise Laboratory. The sample were found alcoholic liquor. The culprits were convicted. The culprits ultimately appealed to SC. Their main contention was that as the expert did not submit the report in person, it was invalid.

The SC, quoting Section 293 of Cr C P that made the report valid as evidence, dismissed the appeal.

Highlights italicised

Relevant Extracts (Verbatim)

3. Background facts in a nutshell are as follows:

The appellants were alleged to have been indulging in smuggling of liquor from Haryana to Delhi. The prosecution alleged that upon receipt of information, SI Lalit Mohan, along with certain police officials, constituted a raiding party, assembled near a traffic intersection and on 8 April 1994 at about 1.45 am intercepted a Tata 407 vehicle in which the appellants were travelling. Despite being signalled to stop, the vehicle sped away. The police officials chased it, and stopped it and apprehended the appellants. Eighteen cartons containing 12 bottles of "Bonnie Scot" special malt whisky, each being a 750 ml bottle, were recovered. Two sample bottles were taken out separately as samples from each carton *i.e.,* 36 bottles. The heads of the sample bottles were enclosed in white *pullanda* and sealed with the letters "LMN". Form M-29 was also filled. The seal was handed over to Head Constable Satpal Singh. An FIR was lodged and a site plan was prepared. The appellants were arrayed as the accused and arrested.

8. *Rajesh Kumar v State (NCT of Delhi)*, (2008) 4 SCC 493.

The Excise Control Laboratory opined that the samples submitted tested positive as whisky. The appellants were charged with having committed offence under section 61 of the Punjab Excise Act, 1914 (in short "the Act"). They stood trial pleading not guilty.

4. The prosecution examined three witnesses. All of them testified as to recovery of the samples. The accused persons did not lead any evidence in their defence. They, however, denied the accusations through statements under section 313 of the Criminal Procedure Code, 1973 (in short "Cr PC").

5. The Metropolitan Magistrate *i.e.* the trial court by judgment and order dated 1 May 2001 found the appellants guilty and sentenced them to six months' simple imprisonment with fine of Rs 2000 and in default a further three months' simple imprisonment. The appeal preferred by the petitioners to the Additional Sessions Judge was dismissed by order dated 22 February 2006.

6. The only stand before the High Court was that there was delay in dispatch of the sample and none was examined to prove the reports. The High Court found that there was no substance in the plea. Referring to the evidence of SI PW-3 and PW-1 about the sealing and sending samples to the Excise Control Laboratory, it was noted that Form M-29 was filled up by PW-2 at the time of recovery. All the prosecution witnesses have testified that the same was filled up by PW-3. The seal after use was handed over to PW-1. These were tallied with the specimen seal of M-29 when the Excise Control Laboratory sealed them. It was noted that there was no necessity for examining any witness to prove the Excise Control Laboratory report as documents were marked in terms of section 293 Cr PC

7. Learned counsel for appellants reiterated the submissions made before the High Court. Learned counsel for the respondent, on the other hand, supported the judgment of the High Court. It is submitted that no question was put to either PW-1 or PW-3 on the aspect of alleged delay in sending the samples.

8. Section 293 Cr PC reads as follows:

> *293. Reports of certain Government scientific experts.—(1) Any document purporting to be a report under the hand of a Government scientific expert to whom this section applies, upon any matter or thing duly submitted to him for examination or analysis and report in the course of any proceeding under this Code, may be used as evidence in any inquiry, trial or other proceeding under this Code.*
>
> *(2) The court may, if it thinks fit, summon and examine any such expert as to the subject-matter of his report.*
>
> *(3) Where any such expert is summoned by a court and he is unable to attend personally, he may, unless the court has expressly directed him to appear personally, depute any responsible officer working with him to attend the court, if such officer is conversant with the facts of the case and can satisfactorily depose in court on his behalf.*
>
> *(4) This section applies to the following Government scientific experts, namely—*
>
> (a) any chemical examiner or assistant chemical examiner to Government;
>
> (b) the Chief Controller of Explosives;
>
> (c) the Director of the Finger Print Bureau;
>
> (d) the Director, Haffkeine Institute, Bombay;
>
> (e) the Director, Deputy Director or Assistant Director of a Central Forensic Science Laboratory or a State Forensic Science Laboratory;
>
> (f) the serologist to the Government;
>
> (g) any other Government scientific expert specified by notification, by the Central Government for this purpose.

9. A bare reading of sub-sections (1) and (2) of section 293 shows that it is not obligatory that an expert who furnishes his opinion on the scientific issue of the chemical examination of

substance, should be of necessity made to depose in proceedings before the court. This aspect has been highlighted by this Court in *Ukha Kolhe v State of Maharashtra,*[9] and *Bhupinder Singh v State of Punjab.*[10] Therefore, there is no substance in the revision petition so far as the conviction is concerned.

13.10 ADDITIONAL CASE LAW

13.10.1 Bona fide Expert[11]

Another question before us is whether the excise inspector, whose evidence was under consideration, had sufficient knowledge to be deemed to be an expert within the meaning of section 45 of the Evidence Act so that the tests adopted by him, together with all the attendant circumstances, could establish beyond doubt that the appellant was in possession of illicit liquor. We think that these are also essential questions of fact. If there is sufficient evidence led by the prosecution to establish its case it becomes the duty of the defence to rebut the evidence. In the case before us, the appellant's counsel cross-examined Shri C.D. Mishra, P.W. 1, excise inspector, at considerable length, but the whole of this cross-examination was directed at showing that the recoveries were not made from the possession of the appellant. No question was put to him in cross-examination to suggest that the appellant questioned the composition or strength of the liquid recovered as alcohol of prohibited strength or the competence of the excise inspector to give his conclusion on the strength of tests adopted by him. Again, no defence evidence was led to indicate that the liquid could be anything else. These considerations would be sufficient to dispose of the points raised on behalf of the appellant in the case before us. We may, however, observe that we agree with the High Court that the proposition contained in *Boosenna's* case,[12] must be confined to its own facts.

> ***We find that the excise inspector who had deposed, at the very outset of his evidence, that he had put in 21 years service as excise inspector and had tested lakhs of samples of liquor and illicit liquor. As already pointed out, the competence of C.D. Misra to test the composition and strength of the liquid under consideration was not questioned at all. We, therefore, think that this particular excise inspector could be treated as an expert within the meaning of section 45 of the Evidence Act. The excise inspector had, in addition, to employing the smelling test, used all the other tests he could reasonably adopt.***

If his competence to give his opinion or the sufficiency of the tests adopted by him had been questioned in the trial court, the prosecution would have been in a position to lead more evidence on these questions. We also find that the objects recovered from the possession of the appellant almost proclaim the nature of his activity and of the liquid which could be in his possession. On the facts and circumstances of this case, neither *Boosenna's* case, nor any other case would, we think help the appellant. Consequently, we dismiss this appeal and affirm the conviction and sentence of the appellant. The appellant should surrender to his bail and serve out the sentence.

13.10.2 Excise Inspector as Liquor Expert[13]

The prosecution admittedly did not send the sample from the contents of the bladder to the chemical examiner. In such cases the chemical analysis is always the surer test to declare

9. AIR 1963 SC 1531 : (1963) 2 Cr LJ 418 : (1964) 1 SCR 926.
10. AIR 1988 SC 1011 : (1988) 3 SCC 513 : 1988 SCC (Cri) 694.
11. *Srichand Batra v State of Uttar Pradesh*, AIR 1974 SC 639 : (1974) 4 SCC 247 : 1974 Cr LJ 590.
    Also see: *State of Andhra Pradesh v Madiga Boosenna*, AIR 1967 SC 1550 : (1967) 3 SCR 871 : 1967 Cr LJ 1398; *State v Madhukar Gopinath Lolge*, AIR 1967 Bom 61 : 1967 Cr LJ 167 : ILR 1965 Bom 257; *Pitamber v State of Uttar Pradesh*, 1975 Cr LJ 948 (HC); *Yerra Kanakarao v State of Andhra Pradesh*, 1974 Andh LT 437 : 1975 Cr LJ 953 (HC).
12. (1967) 3 SCR 871 : AIR 1967 SC 1550 : 1967 Cr LJ 1398.
13. *State of Haryana v Radhey Shyam*, 1977 Cr LJ 528.

as to what the commodity actually recovered from the accused is. In place of doing so the prosecution got the contents of the bladder examined from Shri D.K. Palta, excise inspector and projected him as an expert witness to say that whatever he had examined was liquor. Shri D.K. Palta did not put the contents of the bladder to any laboratory test. He applied two physical tests; the first was that of taste and smell and the second was with the help of a Hydrometer set. In order to style himself as an expert witness he gave his qualifications stating that he was distillery trained and he had put in 13.5 years service in the Department. On the basis of this evidence the learned counsel appearing on behalf of the state wants us to accept that the contents of the bladder were proved to be liquor of illicit origin.

> *So far as the experience of Shri D.K. Palta (P.W. 4) in testing is concerned his statement is extremely unsatisfactory. He did not spell out the training which he had received at the distillery. He did not state whether he was associated with the distillation of liquor, the chemical analysis of this commodity or any method of testing liquor. Unless the type of training received by Shri D.K. Palta at the distillery was stated by him specifically it is difficult for us to accept that he had received any such training which had given him sufficient proficiency to examine liquor and declare it to be so with definiteness. His contention to show experience of testing liquor by the length of his service is also equally unsatisfactory. It is not known from the record in what branch of the Excise Department he had put in service; whether he remained on office duty, field duty or in the branch of the Excise Department which is directly connected with the testing of liquor. Such a vague statement without any particulars of training or type of service does not make the person an expert witness. The prosecution has to prove that the training or length of service was directly connected with the test of liquor.*

13.10.3 Liquor Identification[14]

In support of this appeal it is contended that the evidence of the police inspector Pawar should have been accepted as the respondent was caught running away, keeping the bicycle there, after he was detected riding the bicycle. I do not see any compelling reasons to differ from the finding of the learned magistrate, who had an opportunity to see the witnesses in the witness-box that it may be unsafe to convict the respondent on the sole testimony of the police inspector, Pawar, in view of the circumstances of this case. But in my opinion there is a further infirmity in the prosecution evidence which goes to the root of the matter. There is no legal evidence, in my opinion, on which it could be held that the liquid, for the possession of which the respondent was charge-sheeted, is, in fact, established to be liquor or prohibited liquor by any legal evidence which can be accepted and acted upon. The testimony of Lalbhai is brief and is to the following effect:

> *I have undergone training in testing liquor by the Syke's test. I have brought today a hydrometer and a thermometer to test the contents of the two scaled rubber bladders now before the court. (Note: The seals on the two bladders are intact and they are removed in the presence of the court and the two accused and their pleader and the witness is asked to examine their contents). After taking the necessary tests I say that the liquid contained in each of the two rubber bladders is liquor containing 48.8 of alcohol and 51.2% of water.*

Relying on this testimony, it is urged by the learned assistant government pleader that the Syke's hydrometer test has been accepted as a reliable test to come to the conclusion whether a liquid claimed to be liquor is in fact liquor or not and, in view of the decisions of this court, the evidence of the witness should be accepted. The witness claims to have undergone training in testing liquor. But what is the nature of that training is not testified by the witness at all. In fact, he has given no information to qualify as an expert. Another serious infirmity in the testimony of this witness is that he has given no data from which he could come to the conclusion, even by applying the hydrometer test, that the liquid was liquor. He has not stated what was the specific gravity of the liquid which he tested, nor the temperature, nor has he disclosed the principle with reference to which he came to the conclusion that the liquid should be liquor.

14. *State v Madhukar Gopinath Lolge*, AIR 1967 Bom 61 : 1967 Cr LJ 167 : ILR 1965 Bom 257.

I felt some difficulty in accepting the evidence of the police head constable as evidence of an expert. It is not shown how he has qualified himself to be an expert in testing liquors. But even assuming that by his experience he may have attained some degree of knowledge, the reason he has given, *viz.,* the test carried out by hydrometer and thermometer to determine whether the liquid was liquor or not, is certainly far from satisfactory. If it is known or proved that a certain liquid is liquor or contains alcohol, then it is certainly possible, by means of Syke's hydrometer test and by use of thermometer, to determine the percentage of alcohol from that liquid; but if the basic question that has first to be proved is whether the liquid under test does or does not contain alcohol, it does not appear that hydrometer test alone could *i.e.,* sufficient to come to any such conclusion. An opportunity was, therefore, given to the learned assistant government pleader to call any expert in this subject who may have the necessary knowledge and experience in the matter of testing liquor or alcohol and liquids to find out whether Syke's hydrometer test would furnish a necessary test for determining whether a liquid does or does not contain alcohol. Accordingly, the case was adjourned for recording the evidence of such an expert and was taken up today, when Shri Harbhajan Singh Mahal was examined by the State as an expert. Shri Mahal entered the witness-box and has given his opinion regarding the Syke's hydrometer test and what can be determined by applying that test to a liquid. Shri Mahal is a director of a forensic science laboratory and the chemical analyser to the government of this State and, by his qualifications and experience, he seems to be a scientist of sufficiently wide knowledge and experience. He seems to have made a special study of estimation of alcohol in the blood and contributed papers in well-known American periodicals. He was specifically asked about the Syke's hydrometer test and what conclusions can be drawn from such test. What he has stated, in his own words, is as follows:

> *I know what is Syke's hydrometer test. It is a test for determining the density of liquids. The test is made with the help of an instrument called hydrometer. The instrument is allowed to be immersed in the liquid to be tested and is allowed to float. There are calibration marks on the stem of this instrument. These marks show the density of the particular liquid. When the hydrometer is immersed in the liquid to be tested and the level of the liquid reaches a particular mark on the stem it will mean that the liquid is of that particular density, calibrated at the place upto which the liquid reaches the stem. There is a standard chart or table by reference to which the reading on the calibrated stem can be interpreted to find out the density of that liquid..... If I am given a liquid and asked to test or find out its specific gravity by hydrometer test and it is found that the specific gravity is between and 0.7 it would not be possible to conclude from this much data alone that the liquid contains ethyl alcohol. This would be so even if readings were obtained at different temperatures.*

To court questions the witness has stated that a fairly reliable method to find out whether a liquid is ethyl alcohol or contains ethyl alcohol is by subjecting it to a chemical test and this test is known as iodoform test.

In view of this clear and unequivocal testimony of the expert witness, whose opinion one would always prefer to the opinion of Abubakar Lalbhai, who is a police head constable, claiming to have undergone training in testing liquor by the Syke's test, it is clear that the Syke's hydrometer test will furnish no data to determine whether a particular liquid is liquor or contains alcohol. It may be that once it is known that a particular liquid contains alcohol, the percentage of alcohol in that liquid may be found by the hydrometer test. But when the question to be determined is the primary question, namely, whether the liquid does or does not contain alcohol, the hydrometer test does not appear to be the proper test to come to any such determination.

In view of the testimony of Dr. Mahal, who is the director of forensic science laboratory in this State, there is hardly any room for canvassing that the evidence of the police head constable as to the liquid being liquor could be accepted as legal or sufficient evidence to come to the conclusion that the liquid was liquor or prohibited liquor.

13.10.4 Unchallenged Positive Report of Chemical Examiner Acceptable[15]

In the present case, the medical officer, Padra who had collected blood of the accused in a phial, had sent the same by registered post parcel with a forwarding letter containing facsimile of his seal. The parcel which was sealed in the presence of the medical officer, was received in the chemical analyser's office with seals intact. *The report of the chemical analyser, Ex. 16 clearly shows that seals were intact and it mentions serial number of the letter under which the said bottle was received. The chemical analyser's report was sent under his letter, dated 22 August 1968, addressed to the medical officer, Padra mentioning that letter No. 742, dated 30 September 1967 forwarding therewith a phial containing blood of Chandrasing Prabhatsing bearing serial number 238 received thereon 3 October 1967 by R.P.P. sealed and that seals were perfect as per copy sent. The result of the test of blood showed that it contained 0.1081 % w/v of ethyl alcohol. He had also annexed an extract of technique by which he had performed the test. Thus, when the phial containing blood of the accused was sent by registered post parcel, completely sealed by the medical officer, Padra and the said parcel with seals intact was received by the office of the chemical analyser, it was not necessary for the prosecution to examine some person from the chemical analyser's office to show that the very bottle which was sent by the medical officer, Padra, was received at his end. It is nobody's case that seals on that bottle were removed by some person from the chemical analyser's office before the same was given to him for analysis. On the contrary, the letter Ex. 16 referred to above clearly shows that seals on the bottle with the label were intact and that seals were as per the copy of the forwarding letter, Ex. 15. Under the circumstances, I do not agree with the learned advocate for the respondent that the prosecution should have examined the person who received the bottle and that merely because the person who received the bottle was not examined, the report of the chemical analyser was bad in law. In my opinion, there is no lacuna in the prosecution case and the prosecution had clearly satisfactorily established that the 5 c.c. blood of the accused which was taken by the medical officer, Padra was analysed by the chemical analyser and that on analysis, it was found to contain 0.1081% w/v alcohol.*

He was smelling of alcohol, his speech was incoherent and his pupils were dilated. Reading the evidence of the medical officer together with the evidence of Gunvantray Tribhovandas Dhabalia, assistant chemical analyser, I have no hesitation in holding that the very phial containing blood of the accused sent by the medical officer, Padra was received by the chemical analyser and that the same was analysed by him. In fact, the assistant chemical analyser who was examined by the prosecution was not cross-examined by the accused at all. His evidence has remained unchallenged.

* * * * *

Thus, if the report of the chemical analyser disclosed that the blood of the accused contained 0.1081% of ethyl alcohol, a presumption could be raised that the accused had consumed liquor. It was for the accused then to discharge the burden by showing that he had consumed a medicine or toilet preparation.

13.10.5 Prohibited Liquor[16]

The first contention may be put thus. Under section 66(2) of the Act all that an accused need prove is that he has consumed a medicinal preparation; if he established that, the burden of proving that the medicinal preparation is fit for use as an intoxicating liquor shifts to the prosecution. In the present case the accused has established that he had taken "tincture

15. *State of Gujarat v Chandrasing Prabhatsing Solanki,* 12 Guj LJ 663 : 1971 Cr LJ 1381 (HC).
16. *Vijay Singh v State of Maharashtra*, AIR 1966 SC 145 : (1965) 2 SCWR 538 : 1966 Cr LJ 168 (SC);
Also see: *State of Bombay v Nararandas Mangilal Agarwal*, AIR 1962 SC 579 : (1962) 1 Cr LJ 512 : 1962 Supp (1) SCR 15; *Palaniswami (in re:)*, (1965) 2 Cr LJ 370 (Mad).

Zingeberis", which is a medicinal preparation, but the prosecution failed to prove that it was fit for use as an intoxicating liquor.

To appreciate this contention it is necessary to notice the relevant provisions. Under section 66(1) of the Act, "whoever in contravention of the provisions of this Act, or of any rule, regulation of order made.....consumes..... any intoxicant shall, on conviction, be punished for a first offence with imprisonment for a term which may extend to six months and with fine which may extend to Rs 1,000."

"Intoxicant" is defined to mean, among other things, any liquor; and "liquor" is defined to include, among others, all liquids consisting of or containing alcohol.

But by reason of section 24A(2) of the Act, if it is established that the liquor consumed is contained in any medicinal preparation which is unfit for use as intoxicating liquor, the consumption of such liquor is not an offence under the Act for the Act itself does not apply to such medicinal preparation. We shall revert to the question of burden of proof a little later.

The facts found in this case may now be noticed. The accused says that he consumed "tincture Zingeberis" and produced before the police a sample bottle out of which he says he had consumed "tincture Zingeberis". A sample of the liquid was analysed by the chemical analyser. His report shows that the liquor was a weak Ginger Tincture B.P. 1958 (Tincture Zingeberis Mitis); absolute alcohol content was 89.1% V/V. The report further states as regards alcohol content of the liquid that the sample contains 90.0% of V/V of ethyl alcohol though the B.P. limits were 86 to 90%. V/V. "The analysis has also given the quantity of total solids as 0.62% weight per ml. at 20 degrees to be 0.825 g." In the opinion of the chemical analyser, the sample complied with pharmacopeial specifications. On the basis of the report, the High Court found that the accused consumed a medicinal preparation which was listed in the British Pharmacopia, 1958 edition and which had alcohol contents to the extent of 90% of ethyl alcohol. The chemical analyser to the government of Maharashtra examined the sample blood taken from the body of the accused by applying "modified Cavatte's method',' and gave his report to the effect that the sample blood of the accused contained 0.207 mg. per cent W/V of ethyl alcohol. The High Court also found on the expert evidence that blood alcohol concentration taking a normal dose of tincture Zingeberis Mitis would be about 0.007% W/V and the accused should have taken roughly about 125 c.c. of tincture Zingeberis to induce an alcohol content of 0.207% found in his blood by the chemical analyser. On the basis of the evidence of Dr. Deshmukh, the High Court also found that tincture Zingeberis Mitis was a preparation which might be consumed for intoxication and that intoxication would not be accompanied by any other harmful effects. On the other hand, the accused has not adduced any evidence that the said medicine is a medicinal preparation.

The question whether the prosecution has discharged its burden of proof in this case will have to be considered on the basis of the said facts found by the High Court. Section 66(2) of the Act which bears on the question of burden of proof reads thus:

> *Subject to the provisions of sub-section (3), where in any trial of an offence under clause (b) of sub-section (1) for the consumption of an intoxicant, it is alleged that the accused person consumed liquor, and it is proved that the concentration of alcohol in the blood of the accused person is not less than 0.05% weight in volume then the burden of proving that the liquor consumed was a medicinal or toilet preparation ..... containing alcohol, the consumption of which is not in contravention of the Act or any rules, regulations or orders made thereunder, shall be upon the accused person, and the court shall in the absence of such proof presume the contrary.*

It has been proved in this case that the accused person consumed liquor and that the concentration of alcohol in his blood was more than 0.05% weight in volume. So in terms sub-section (2) of section 66 of the Act the burden of proving that the liquor consumed was a medicinal preparation containing alcohol, the consumption of which was not contravention of the Act, or the rules made thereunder, shifted to the accused. He could have discharged

this burden by proving, *inter alia*, that the medicinal preparation containing alcohol which he had taken was unfit for use as an intoxicating liquor; if so much had been established, as under section 24A of the Act, the Act itself does not apply to such medicinal preparations, the accused would not have committed any offence under the Act. The High Court found that the accused had not placed any material to prove that tincture Zingeberis Mitis was unfit for use as an intoxicating liquor; indeed, it accepted the evidence adduced on behalf of the prosecution and held that it was fit for use as an intoxicating liquor. In this case not only the accused failed to discharge the burden so shifted to him by the statute, but the prosecution has also established that the said medicinal preparation was fit for use as an intoxicating liquor. Reliance is placed by the learned counsel for the appellant on the decision of this court in *State of Bombay (now Gujarat) v Narandas Mangilal Agarwal*[17] wherein it was held, in the circumstances of the case, that it was for the State to prove that the medicinal preparation was not unfit for use as intoxicating liquor. But that decision as given on the relevant provisions of the Act before it was amended by the Bombay Act XII of 1959. Section 66(2) was added by the said Act which in express terms states that in the circumstances mentioned in the sub-section the burden of proof shifts to the accused. The said decision cannot therefore, be invoked in the changed circumstances. The present case falls to be decided on the interpretation of section 66(2) of the Act. We, therefore, hold that the High Court came to the correct conclusion on the question of burden of proof and gave its finding on the evidence adduced before it.

13.10.6 Improper Collection[18]

Now it is clear that in order to establish the guilt of the accused for an offence under section 66(1)(b) of the Act, the prosecution mainly relies on a report received from the chemical examiner in respect of the blood of the accused taken by Dr. Talati on the date of the offence and then sent for examination to the chemical examiner at Junagadh through the police officer. When that is so, the point raised by Mr. Thakore assumes considerable importance as the guilt or otherwise of the accused will have to be determined on the strength of the report produced as Ex. 7 in the case. In that event, the presumption of his guilt arises under section 66(2) of the Act and since his explanation is disbelieved, he would be liable under section 66(1)(b) of the Act. We have, therefore, to turn to the Bombay Prohibition (Medical Examination and Blood Test) Rules, 1959, hereinafter to be referred to as "as Rules" and find out as to whether the requirements contemplated in rule 4 are of a mandatory character and a breach thereof would affect the evidence contained in the report produced by the chemical examiner. Such a point arose in the case of *Karansingh Balubha v State of Gujarat*[19], where it was held that if the prosecution relies solely on the report of the chemical analyser to prove the fact of concentration in blood which had been collected and sent to the chemical analyser in the course of an investigation of an offence under the Bombay Prohibition Act, such certificate could be evidence only if the certificate had been obtained in the prescribed manner as laid down in section 129A of the Act. Then it was held that section 129A, clause (2) of the Bombay Prohibition Act, 1949, casts duty on the registered medical practitioner before whom such a person was produced in the course of the investigation to examine such a person and collect and forward in the prescribed manner the blood of such person, and on the chemical analyser to certify the result of the test of the blood forwarded to him stating the percentage of alcohol and such other particulars. Rules 4 and 5 of the Bombay Prohibition (Medical Examination and Blood Test) Rules, 1959, which lay down the manner of collection and forwarding of

17. AIR 1967 SC 1550 : (1967) 3 SCR 871 : 1967 Cr LJ 1398.
18. *Dalsukhji Varvaji v State of Gujarat*, (1969) 10 Guj LR 553 : 1969 Cr LJ 695 (Guj HC). Also see *N.K. Marulkar v State of Bombay*, 1967 Cr LJ 858 (Bom); *Karansingh Balubha v State of Gujarat*, AIR 1967 Guj 219 : 8 Guj LR 31 : 1967 Cr LJ 1142 (Guj HC).
19. AIR 1967 Guj 219 : (1967) 8 Guj LR 31 : 1967 Cr LJ 1142 (Guj HC).

blood, are mandatory provisions. The legislature had advisedly required the despatch of the sample phial to be made by the doctor through post or a special messenger with his own forwarding letter so that there might not be any scope of tampering with the sample phial. If that safeguard was disregarded and the sample phial was handed over to the investigating officer himself, this salutary safeguard would be completely set at naught. In those circumstances, the court held in that case that the prosecution having not led any other evidence to prove that fact of concentration of the blood, no presumption could be drawn under section 66(2) of the Act and it was not for the accused to rebut the burden raised by the presumption. On the basis of this decision, it can be said that the rules 4 and 5 are of a mandatory character and in the present case since the phial containing blood of the accused was sent by Dr. Talati through the investigating officer himself, namely the complainant, head constable, the salutary safeguard providing for the despatch of the sample phial to be made by the doctor through post or a special messenger with his own forwarding letter has been completely disregarded.

13.10.7 Proper Submission of Samples to Chemical Examiner[20]

The Legislature of the State of Bombay being faced with this interpretation imposing a serious burden which the prosecution had to undertake in trials for offences of consumption or use of liquor contrary to the provisions of the Act, for due enforcement of the law and to prevent evasion, enacted certain additional provisions by Bombay Act 12 of 1959. By that Act, section 60 was renumbered as section 66(1) and sub-section (2) was added thereto in the following form:

Subject to the provisions of sub-section (3), wherein any trial of an offence under clause (b) of sub-section (1) for the consumption of an intoxicant, it is alleged that the accused person consumed liquor and it is proved that the concentration of alcohol in the blood of the accused person is not less than 0.05%, weight by volume, then the burden of proving that liquor consumed was a medicinal or toilet preparation, or an antiseptic preparation or solution, or a flavouring extract essence or syrup containing alcohol the consumption of which is not in contravention of the Act or any rules, regulations or orders made thereunder, shall be upon the accused person and the court shall in the absence of such proof presume the contrary.

By sub-section (3) the provisions of sub-section (2) are not to apply to consumption of liquor by indoor patients during the period they are being treated in any hospital, convalescent home, nursing home, or dispensary, maintained or supported by government or a local authority, or by charity, or by such other persons, in such other institutions, or in such circumstances as may be prescribed. The result of this amendment was to make, except in the cases expressly provided in clause (3), concentration of alcohol in excess of 0.05%, weight in volume in blood presumptive evidence of consumption of liquor in contravention of the provision of the Act and the burden of proving that the liquor consumed was a medical or toilet preparation or an antiseptic preparation or solution, or a flavouring extract, essence or syrup, lay upon the person charged with the offence.

The case of the prosecution in this case rested primarily upon the report of the chemical examiner certifying that alcohol concentration in the blood of the appellant which was extracted at 6 am on 3 April 1961 was in excess of the percentage prescribed by section 66(2). The prosecution had, therefore, to establish that the specimen examined by the chemical examiner was the specimen of blood collected from the body of the appellant and that the specimen disclosed concentration of alcohol in excess of the permissible limits. It is somewhat unfortunate that the trial magistrate did not appreciate that the only important piece of evidence on which the prosecution case against the appellant rested was contained in the report of the chemical examiner. There is no dispute that the appellant went to

20. *Ukha Kolhe v State of Maharashtra*, AIR 1963 SC 1531 : (1964) 1 SCR 926 : (1963) 2 Cr LJ 418.

the civil hospital early in the morning of 3 April 1961. He has admitted that fact in his statement before the court. Dr. Kulkarni has deposed that on being told about the death of Mohamad Yusuf the appellant fainted and was admitted to the hospital, and that he found that the appellant was smelling of alcohol. Dr. Kulkarni has stated that no treatment was given to the appellant. Dr. Rote was asked by Dr. Kulkarni to collect a specimen of blood from the body of the appellant, and a blood specimen was accordingly taken and the phial was sealed in his presence by a laboratory servant. Dr. Rote stated in cross-examination that no methyl spirit was applied before extracting blood. The certificate of Dr. Rote dated 13 April 1961 that he had collected blood from the body of the appellant on the morning of 3 April 1961 and that the bottle containing the blood was sealed in his presence corroborates the statement.

But there is no evidence on the record about the person in whose custody this phial remained till it was handed over to the sub-inspector of police on 13 April 1961 when demanded. There is also no evidence about the precaution taken to ensure against tampering with the contents of the phial when it was in the civil hospital and later in the custody of the police between 13 April 1961 and 18 April 1961. Even the special messenger with whom the phial was sent to the chemical examiner was not examined and Ext. 43 which was the acknowledgement signed by some person purporting to belong to the establishment of the chemical examiner does not bear the official designation of that person. The report of the chemical examiner mentions that a sealed phial was received from the police officer by letter No. C/010 of 1961 dated 18 April 1961, but there is no evidence that the seal was the one which was affixed by Dr. Rote on the phial. These undoubtedly were defects in the prosecution evidence which appear to have occurred on account of insufficient appreciation of the character of the burden which the prosecution undertakes in proving a case of an offence under section 66(1)(b) relying upon the presumption under section 66(2).

It was assumed by the trial magistrate that the phial containing blood collected by Dr. Rote was kept in a safe place and could not be tampered with, that it was kept in such a place that it was not liable to deteriorate, that thereafter this phial also remained with the police at a place where it could not be tampered with, and that the phial sealed by Dr. Rote was delivered by the special messenger to the establishment of the chemical examiner and that the same phial was examined by the chemical examiner, and that between 3 April 1961 and 19 April 1961 when the contents of the phial were subjected to chemical examination, they had not deteriorated. Both the prosecutor and counsel for the appellant appear to have contributed to the somewhat slipshod trial of the case. Dr. Kulkarni and Dr. Rote were examined as witnesses for the prosecution, but no examination or cross-examination of either was directed in respect of these important matters, and even to the investigating officer, no questions seeking to elicit information on these matters were asked. The report of the chemical examination of the blood specimen collected at 11 am on 3 April 1961 was also not tendered in evidence by the prosecution though the same was demanded.

Section 129A contemplates two classes of certificates—certificate of the results of the examination by a registered medical practitioner whether the person sent to him has consumed any intoxicant and the certificate of the chemical examiner of the examination of blood collected by a registered medical practitioner and sent to him for examination. These are made admissible by virtue of clause (a) of section 129B. Clause (b) of section 129B deals with the admissibility of reports in respect of the examination of persons or of matters or things submitted to the registered medical practitioner for examination or analysis and report. These are undoubtedly different from the certificates of examinations made under section 129A. The report of the registered medical practitioner under clause (b) of section 129B may be upon a "matter or thing" and so may be in respect of blood specimen submitted to him.

On an analysis of sections 129A and 129B, it is clear that the Legislature has provided in the first instance for compelling persons suspected of consuming intoxicants to be produced and to submit themselves for examination and extraction of blood which, under the law as it stood, could not be secured, but thereby the law did not provide for only one method of proving that a person had consumed illicit liquor within the meaning of section 66(2). The Legislature has made the certificate of the examination under section 129A, sub-sections (1) and (2) admissible without formal proof; but by sub-section (8) of section 129A, the adoption of any other method of collection of evidence for proving that a person accused has consumed an intoxicant is not precluded and a report of any registered medical practitioner which tends to establish that fact in respect of matters specified in clause (b) of section 129B is also made admissible. On that view of sections 129A and 129B, there is no warrant for assuming that it was intended thereby to exclude in trials for offences under section 66(1)(b) of the Act the operation of section 510 of the Code of Criminal Procedure. The Code makes a document purporting to be a report under the hand of a chemical examiner and certain other documents upon any matter or thing duly submitted to him for examination or analysis and report, admissible in any enquiry, trial or other proceeding under the Code. The terms of section 510 of the Code of Criminal Procedure are general; but on that account it cannot justifiably be assumed that by enacting sections 129A and 129B, the Legislature intended that the certificate of a competent officer in respect of matters not governed thereby shall become inadmissible. It is open to the prosecution to rely in corroboration of a charge of consumption of illicit liquor upon a certificate under clause (a) of section 129B if it is obtained in the manner prescribed by section 129A, and also to rely upon the report of a registered medical practitioner in respect of any person examined by him or upon any matter or thing duly submitted to him for examination or analysis and report. It is also open to the prosecution to rely upon the report of the chemical examiner in cases not covered by section 129A as provided under section 510 of the Code of Criminal Procedure (section 293 of the new Code).

It was urged before the Sessions Court that the report of the chemical examiner was submitted by that officer not to the court nor to the medical officer but to the police officer and it was by virtue of section 162 of the Code of Criminal Procedure inadmissible, except to the extent permitted within the strict limits prescribed by the section. But section 510 makes provision with regard to proof of documents by production thereof, and the application of section 162(1) is expressly made subject to what is provided in the Code of Criminal Procedure. Exclusion from the evidence of any part of a statement made to a police officer or a record from being used for any purpose at any enquiry or trial in respect of an offence under investigation at the time when such statement was made is "save as hereinafter provided". The word "hereinafter" is, in our judgment not restricted in its operation to section 162 alone but applies to the body of the Code: to hold otherwise would be to introduce a patent inconsistency between section 207A and section 162 of the Code, for by the former section in committal proceeding, statements recorded under section 162 are to be regarded as evidence. The contention raised that the report made to the police officer by the chemical examiner was inadmissible in evidence was rightly rejected.

Finally, it was urged that the blood specimen was not submitted in the manner prescribed by rules framed under the Bombay Prohibition Act, and therefore it could not be regarded as "duly submitted".

The government of Bombay has, by notification dated 1 April 1959, framed rules under clause (w) of section 143 of the Bombay Prohibition Act, called the Bombay Prohibition (Medical Examination and Blood Test) Rules. Rule 3 deals with the examination of a person by a registered medical practitioner before whom he is produced under sub-section (1) of section 129A. Rule 4 provides for the manner of collection and forwarding of blood specimen and rule

5 deals with certificates of tests of "sample blood". All these rules deal with medical examination of a person who is produced before a registered medical practitioner under sub-section (1) of section 129A. To an examination to which section 129A does not apply, the rules would have no application. The law not having prescribed a particular method of submitting specimen of blood collected from an accused person when blood has been collected before any investigation has started, it is unnecessary to consider the argument whether the expression "duly admitted" used in section 510 of the Code of Criminal Procedure means merely in the manner prescribed by rules in that behalf or as pointed out by the learned Sessions Judge, submitted after taking adequate precautions for ensuring its safety and for securing against tampering. In the present case, the blood specimen was collected by Dr. Rote and thereafter it was handed over to the police officer on demand by him and ultimately submitted to the chemical examiner for his examination, it would, in our judgment be regarded as "duly submitted".

13.10.8 Inadmissible Reports[21]

In the present case all that the report of the chemical examiner says is that the concentration of alcohol in the sample of the blood analysed by him was 0.191%. Now there are several methods for determination of alcohol in human blood. As pointed out in *Taylor's Principles and Practice of Medical Jurisprudence*, Vol II, p 446, the panel of the Royal Institute of Chemistry after considering many methods of investigation including the principal ones in use and as a result of collaborative work on the selected procedure by a group of experienced analysts, favours the following methods of testing:

1. A precisely described and amended Cavett (micro) method.
2. A detailed and slightly modified Kozelka and Hine (micro) method.

   According to the panel, these two methods should be recognised as the official methods for court work. In the present case the court is not told which method of testing was employed by the chemical examiner— whether it was one of the methods mentioned above or a different method altogether. If the method of testing employed by the chemical examiner was not one of the methods mentioned above, it would be a question for consideration how far the method employed by the chemical examiner was a reliable method and the result of his analysis could be depended upon for arriving at a particular conclusion. Even if the method of testing employed by the chemical examiner was one of the methods mentioned above, it is essential that the court should know which one of these methods it was that was employed by the chemical examiner. As observed in Taylor's book at p 447 "the Cavett method cannot be used if ketonic bodies are present and it is essential, therefore, that preliminary tests for these substances should be made according to certain methods, whereas the presence of ketonic bodies does not interfere with the procedure in the Kozelka and Hine method. If the Cavett method was used by the chemical examiner, it would have to be ascertained whether any preliminary tests for ketonic bodies were made and what was the result of those tests. The presence of ketonic bodies would interfere with the procedure followed in the Cavett method and affect the correctness of the result. Apart from this requirement, Taylor's book also lays down the following precautions which must be taken in the Cavett method.

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21. *Suleman Usman Memon v State of Gujarat*, (1961) 2 Cr LJ 78 (Guj).
    Also see: *State v Bhausa Hanmantsa Pawar*, (1962) 2 Cr LJ 466 : AIR 1962 Bom 229 : ILR 1962 Bom 472; *State of Maharashtra v Ramsingh Desasingh*, AIR 1963 Bom 68 : ILR 1962 Bom 493 : (1963) 1 Cr LJ 567; *Mahadevayya Veerabhadrayya Hiremath v State of Mysore*, 1966 Cr LJ 270 : AIR 1966 Mys 75.

Note 1

It is essential to ensure that the small Erlenmeyer flask and stopper are thoroughly cleaned with hot chromic acid and rinsed at least six times with tap water and twice with distilled water. Dry both flask and stopper in an air oven. Grease must not be used on stoppers for lubrication merely damp the part of the stopper that fits in the top of the flask with distilled water and ensure that the water does not enter the flask.

Note 2

As this is a micro method, it is essential to take the special precautions that are common in such work. The laboratory itself must be clean, and free from dust, and exceptional care in such matters must be taken. It is essential that the distilled water should be freshly distilled into a clean glass vessel. Ordinary laboratory distilled water is likely to give falsely high results.

Again the court is not told whether the Kozelka and Hine method was employed by the chemical examiner and if so, whether these precautions were observed. The court is not even told as to what was the quantity of blood tested by the chemical examiner. The report of the chemical examiner is silent as to the reagents. Though the Cavett method as well as the Kozelka and Hine methods are elaborate as appears clearly from the description of these methods given in Taylor's book, the report does not say a word as regards the process actually carried out by the chemical examiner for arriving at the concentration of alcohol in the blood of the accused nor does it contain any factual data revealed as a result of the process employed by the chemical examiner. Brevity seems to be the only merit of the report. The report contains nothing more than the mere *ipse dixit* of the chemical examiner that the concentration of alcohol in the blood of the accused was 0.191%, there is no other evidence to show what was the concentration of alcohol in the blood of the accused and in that event the prosecution must be held to have failed to establish that the concentration of alcohol in the blood of the accused was not less than 0.05%. The prosecution cannot rely on the presumption under section 66(2) of the Act and without the aid of the presumption, the prosecution must obviously fail.

13.10.9 Reports Admissible[22]

It is most urged by the petitioner's counsel that Exhibit P-5 the chemical examiner's report, does not contain any data or particulars which are necessary to help the court in accepting the opinion; it merely states that the bottle contained alcoholic content 21.9% V/V at 60 F. The petitioner has relied on *Prabhu Babaji Navee v State of Bombay*[23]. In that decision their Lordships have held that it is the chemical examiner's duty to indicate the number and extent of bloodstains found on the clothes sent to him for examination. In my opinion, this decision is not of any assistance to the petitioner. That was a case of bloodstains found on the clothes of the accused person and not a case concerning the report sent by the chemical examiner of the analysis of percentage of alcohol contained in the article sent to him for examination. Further it may be noted that their lordships did not say that because of the defects pointed out by them, the chemical examiner's reports not giving a detailed description is inadmissible. In *Suleman Usman Memon v State of Gujarat*,[24] it has been held that the report of the chemical examiner must show the tests or experiments performed by him, the factual data revealed by such tests or experiments and the results leading to the formation of the opinion from such factual data; otherwise, the report would have no value as a piece of evidence. This judgment

22. *Mahadevayya Veerabhadrayya Hiremath v State of Mysore*, AIR 1966 Mys 75 : 1966 Cr LJ 270 (Mys).
Also see: *State of Maharashtra v Ramsingh Desasingh*, AIR 1963 Bom 68 : ILR 1962 Bom 493 : (1963) 1 Cr LJ 567.
23. AIR 1956 SC 51 : 1956 Cr LJ 147.
24. AIR 1961 Guj 120 : (1961) 2 Cr LJ 78.

of a single judge has not been approved by a Bench decision in *State of Maharashtra v Ramsingh Desasingh*.[25] Chainai, C.J. speaking for the Bench has stated:

> *The court cannot refuse to consider the evidence furnished by a certificate of the chemical examiner or assistant chemical examiner issued under section 129A of the Bombay Prohibition Act, 1949, merely because it does not mention the data on the basis of which the chemical examiner arrived at the percentage of alcohol mentioned in his certificate or because he has not given the reasons for his conclusion. If the court feels that it should have more information in order to satisfy itself about the correctness or otherwise of the certificate, the court should summon the chemical analyser or ask the prosecution to summon and examine him. But without examining the chemical analyser, the court would not be justified in holding that the charge against the accused has not been proved, merely because the certificate issued by the chemical analyser only mentions the percentage of alcohol found in the blood of the accused and does not give any other particulars.*

Following, with respect, the decision reported in 64 Bom LR 451 : AIR 1963 Bom 68, I hold that the absence of data in Exhibit P-5 does not make it inadmissible in evidence. It was open to the petitioner if he wanted to have some more details or particulars about the report to request the court to summon the chemical examiner for cross-examination. The petitioner has not done so and he cannot now contend that the report has no evidentiary value.

With regard to the question of delay in the examination of the bottle, this is not a question of law which could be agitated before this court in a revision petition. The offence was committed on 14 July 1962 and the bottle was immediately seized and sealed in the presence of panchas. The same was sent to the chemical examiner on 27 July 1962. The fact that the report of the chemical examiner was received long after this, does not in any way affect the value of the report of the chemical examiner.

13.10.10 Intoxication[26]

In order, therefore, to arrest the accused, he must have been in a state of intoxication while he was in Nagercoil. Intoxication or state of intoxication is not defined in the Act; and so, we have to look to its meaning through authoritative English dictionaries. In the Encyclopaedia Britannica, "Intoxication" is defined to be as poisoning, whether by drug or liquor or other toxic substances, and hence, the condition of the nervous system produced by excessive drinking of alcohol. In the absence of any specific definition of this word in the statute in which the term is used, the word "intoxication" applies only to the excessive use of intoxicating liquors or drugs.

What is mentioned in the section is that, if anyone is seen 'in a state of intoxication' in a prohibition area, he is said to have committed an offence. The state of intoxication may be taken to be practically equivalent to a state of drunkenness, so that the person intoxicated was incapable of knowing the consequences of his action. By reason of intoxication, if a person is capable of knowing the nature of the act done, at the time he was under the influence of the alcohol his act is not considered to be an offence under the Penal Code (*vide* section 74 of the Travancore Penal Code).

So, what is necessary to be found out in this case is whether the accused was in a state of intoxication when he was said to have been taken into custody by P.W. 8. I shall refer later on to the extremely suspicious circumstances under which P.W. 8 himself, a head constable in mufti, came and took the accused into custody. P.W. 7, the inspector of police who investigated the case, had sworn in clear terms that his investigation revealed that the accused had taken brandy while he was in Trivandrum and before he got into the bus for Nagercoil. This bus started from Trivandrum at about 8 pm and it was an ordinary bus. It reached Mennakshipuram at

25. 64 Bom LR 451 : AIR 1963 Bom 68 : (1963) 1 Cr LJ 567.
26. *Narayanan Nair v State*, AIR 1952 Trav-Co 239 : 1952 Cr LJ 1095 : 1952 Ker LT 159 .
Also see: *Shanmugam (in re:)*, AIR 1954 Mad 376 : (1952) 2 Mad LJ 579 : 1954 Cr LJ 486 (Mad); *Connabatula Satya Rao v State of Andhra Pradesh*, 1954 Cr LJ 1529 (Andh); Re *Palaniswamy*, 1956 Cr LJ 370 (Mad).

11.15 pm that day. It was at 12.50 the same night that P.W. 8 was said to have seen the accused standing at the gate of the Raghuvilas Hotel smoking a cigarette. So, not less than five hours must have elapsed since he had taken brandy.

There was absolutely no case or suggestion that the accused had brought any brandy and took it in Nagercoil, just before he was taken into custody. There was no necessity to speculate on that point, as the prosecution had no such case. The poisoning by alcohol is dealt with exhaustively in *Taylor's Medical Jurisprudence*, Vol II, pp 535 and 536, 1948 Edn. The relevant portion is quoted below:

> *Ethyl alcohol is produced by the fermenting action of yeast on sugars, and is concentrated by distillation. The percentage of absolute alcohol in various beverages is approximately as under taking round figures without regard for precise accuracy:*
>
> *Spirits, such as whisky, brandy, gin and rum, contain about 40% of alcohol.*
>
> *Fortified wines, such as port and sherry, contain about 20% of alcohol.*
>
> *Natural wines, such as claret and burgundy, contain about 10% alcohol.*
>
> *Strong beer contains about 5% of alcohol.*
>
> *A "large whisky", which should be half a gill (2½ ounces), contains therefore 1 ounce, or 30 c.c., of absolute alcohol, and the same amount will be present in a pint of strong ale, half a pint of claret, or a quarter of a pint of port.*
>
> *The absorption of alcohol from the stomach and small intestine begins soon after ingestion. The rate of absorption is dependent upon a number of factors, the most important being the presence or absence of food in the stomach. Food delays absorption and the delay is most marked in the presence of fat and protein (Haggard and Greenberg, 1934: Mellanby, 1919). The concentration of alcohol is important, and generally the stronger the drink the more rapid is its effect. Absorption is usually complete within the first hour, so that after a single dose the maximum concentration in the blood is reached within the same period. After absorption, the alcohol is distributed more or less evenly throughout the tissues, with the exception of the bones and fat. Thus by estimating the amount of alcohol in the blood it is possible to calculate the approximate amount which must have been ingested.*
>
> *About 90% of the alcohol absorbed is oxidised and the remaining 10%. is excreted, mainly by the kidneys and the lungs. At no stage in its oxidation is alcohol stored in the tissues and its disappearance from the blood takes place at a fairly uniform rate, which for rough calculation may be placed at 10 c.c. per hour (0. 185 c.c. per kg. of body weight, Mellanby, 1919). It thus takes about three hours for the blood to be cleared of alcohol after the ingestion of a single large whisky. The excretion by the kidney is of importance in that at the time of secretion the urine has a similar concentration as that in the plasma at the same time, though higher than that in the blood as a whole, the ratio being approximately 1.3: 1.*
>
> *The concentration in the blood varies, however, increasing during absorption and then decreasing with oxidation. It follows, then that the concentration of alcohol in a given sample of urine will correspond with the average concentration in the blood during the time the urine has been collecting in the bladder (Smith and Stewart, 1932). If the concentrations in the urine and blood are estimated some time after ingestion, when the alcohol in the blood has fallen through oxidation, it may be found that the urine alcohol is at a higher level. Urine examination may, therefore, be used instead of blood examination and gives a reasonably accurate idea of the total alcohol in the body. A considerable number of investigations have been made in an endeavour to co-relate the alcoholic concentration in the blood with the behaviour of the individual.*
>
> *It is generally agreed that with concentrations below 0.05% there is little change to be observed on clinical examination: at 0.10% a number show mild symptoms and quite possibly some more decided symptoms. Between this level and 0.2% the number showing decided symptoms of intoxication increases, and at the latter figure it is to be expected that practically all will be diagnosed clinically. The critical concentration seems to lie at or about the 0.15 level and any person with this amount in his blood can be considered to have imbibed a dangerous amount of alcohol. With increasing concentration the symptoms become more intense and at concentrations beyond 0.2% up to 0.5% there is likely to be marked incoordination, coma and possibly death.*

Knowing that the concentration in the blood is the same as that in the tissues, we may translate these percentages into amounts drunk as follows. When the amount in the blood is equal to 0.15%, the person has ingested as a minimum within a few hours of the test 1.5 c.c. of absolute alcohol per kilogramme of body weight. In a man of ten stones this would amount to about 3-one-second ounces of absolute alcohol, or about 1-one-second gills of whisky at proof.

"Effects of Alcohol". The only acute effect of alcohol which is of any interest is its effect on the central nervous system. Its first effect appears to be a depression of the highest evolutionary centres, the centres regulating the conduct, judgment, and self-criticism. It passes progressively downwards through the centres of earlier evolutionary origin until the motor centres are reached and finally it depresses and paralyses the vital centres in the medulla.

There is first a feeling of well-being and a certain slight excitation. The actions, speech and emotions are less restrained, due to a lowering of the inhibition normally exercised by the higher centres of the brain. With this there is increased confidence and a certain carelessness of consequences. This implies a lack of self-control, which is one of the first things observed after alcohol, and which is a constant feature of alcoholic poisoning.

When the narcosis has penetrated more deeply the sense perceptions and skilled movement are affected. The increased loss of the inhibitory action of the higher centres causes an alteration in the conduct of the individual according to the dictates of his inherent desires and emotions.

This accounts for the fact that an individual may become morose, gay, irritable, excitable, pugnacious, sleepy, and so on, according to the dominant impulse which have been unleashed by the drug. The reaction times are somewhat lengthened, and there is a certain clumsiness and in-coordination in the finer and more skilled movements shown by slight alteration in speech and in the finer finger movements.

This passes into a third stage, where the motor and sensory cell are deeply affected; speech becomes thick and slurring; coordination is markedly affected, causing the patient to stagger and possibly to fall. Finally a stage is reached where the narcosis affects the whole nervous system, and the patient passes into a state of coma with stertorous breathing, indicating a commencing paralysis of the respiratory centre.

The coma gradually lightens into a deep sleep, and the patient if left alone, usually recovers in eight to ten hours, and wakes up with gastro-intestinal irritation, and usually nausea, vomiting and severe headache. If the coma continues for more than ten hours, the prognosis is bad.

The accused was not in any condition of coma when P.W. 8 saw him. According to the prosecution, it was also more than five hours since he had taken the liquor. He could not, therefore, have been in a state of intoxication at 12.50 am. P.W. 7 himself stated that the accused pleaded before him to let him free. That would not be the condition of a person who was in a state of intoxication. The tests, to find out whether a person is intoxicated or not, are given at pp 613 and 614 of Modi's Medical Jurisprudence and Toxicology. They are given below:

In order to ascertain whether a particular individual is drunk or not a medical practitioner should bear the following points in mind:

1. *The quantity taken is no guide.*
2. *An aggressive odour of alcohol in the breath, unsteady gait, vacant look, dry and sticky lips, congested eyes, sluggish and dilated pupils, unsteady and thick voice, talks at random and want of perception of the passage of time are the usual signs of drunkenness.*
3. *Drunkenness does not come within the cognizance of the police, unless the man is dangerous to himself or to his property or that he is annoying or dangerous to others.*

A special committee of the British Medical Association was appointed to consider the question of the definition and diagnosis of drunkenness. This committee arrived at the following conclusions and recommendations in regard to persons accused of being "drunk":

1. *That the word "drunk" should always be taken to mean that the person concerned was so under the influence of alcohol as to have lost control of his faculties to such an extent as to render him unable to execute safely the occupation on which he was engaged at the material time.*

2. *That it is desirable that a medical practitioner should base his opinion on the following considerations:*

   Whether the person concerned has recently consumed alcohol.

   Whether the person concerned is so much under the influence of alcohol as to have lost control of his faculties to such an extent as to render him unable to execute safely the occupation on which he was engaged at the material time.

   Whether his state is due, wholly or partially, to a pathological condition which causes symptoms similar to those of alcoholic intoxication, irrespective of the amount of alcohol consumed.

3. *That in the absence of any pathological conditions a person is definitely under the influence of alcohol if there is a smell of alcoholic liquor in the breath and or in the vomited matter (if any) provided there is a combination of all or most of the following groups of signs or symptoms:*

   A dry and furred tongue, or conversely, excessive salivation.

   Irregularities in behaviour, such as insolence, abusive language, loquacity, excitement or sullenness, and disorder of dress.

   Suffusion of the conjuctince and reaction of the pupils. The pupils may vary from a state of extreme dilatation to extreme contraction and may be equal or unequal.

   In the opinion of many police surgeons when alcohol in toxic quantity has been consumed, the pupil reflex to 'ordinary light' is absent, whereas the pupil will contract in 'bright light' and remain contracted for an abnormally long time, indicating the delayed reaction of the pupil.

   Loss or confusion of memory, particularly as regards recent events and appreciation of time.

   Hesitancy and thickness in speech and impaired articulation.

   Tremors and errors of coordination and orientation.

4. *That there is no single test by itself which would justify a medical practitioner in deciding that the amount of alcohol consumed had caused a person to lose control of his faculties to such an extent as to render him unable to execute safely the occupation on which he was engaged at the material time. A correct conclusion can only be arrived at by the result of the consideration of a combination of several tests or observations such as:*

   General demeanour;

   State of the clothing;

   Appearance of the conjuctince;

   State of the tongue;

   Smell of the breath;

   Character of the speech;

   Manner of walking, turning sharply, sitting down and arising, picking up a pencil or coin from the floor;

   Memory of incidents within the previous few hours and estimation of their time intervals;

   Reaction of the pupils;

   Character of the breathing, especially in regard to hiccup.

5. *That the following are the tests, upon which taken by themselves, little stress should be laid in deciding whether or not a person is under the influence of alcohol:*

   Presence of tachycardia (rapid pulse);

   Repetition of set words or phrases;

   Character of handwriting;

   Walking along a straight line;

   Failure of convergence of the eyes.

In this case P.W. 6 to whom the accused had been taken had, even if what he said was true, subjected the accused only to a very perfunctory examination. The certificate, Ex. B., given by P.W. 6, stated that the accused was in a state of drunkenness for the following reasons, viz., smell of brandy from nose, redness of his eyes, very rapid pulse and tremors of his hands. These findings are absolutely insufficient to hold that the accused was in a state of intoxication. Seeing the delicate position in which P.W. 7 (the inspector of police) and P.W. 6 (the medical officer) were put, they attempted to improve upon what they had stated in the earlier records. I do not think that it was proper on their part to resort to such methods, even though this was one of the earliest cases in the prohibition area.

13.10.11 Strong Smell of alcohol: Guide to licit/illicit Liquor[27]

He has strongly relied on the decision of the Supreme Court in *Behram Khurshid v State of Bombay*,[28] in which it has been observed as follows:

> *The bare circumstance that a citizen accused of an offence under section 66(b) is smelling of alcohol is compatible both with his innocence, as well as his guilt. It is a neutral circumstance. The smell of alcohol may be due to the fact that the accused had contravened the enforceable part of section 13(b) of the Prohibition Act. It may well be due also to the fact that he had taken alcohol which fell under the unenforceable and inoperative part of the section. That being so, it is the duty of the prosecution to prove that the alcohol of which he was smelling was such that it came within the category of prohibited alcohols and the onus was not discharged or shifted by merely proving a smell of alcohol.*

Relying on this passage, the learned counsel for the petitioner contends that the mere fact that the petitioner was smelling of alcohol does not carry the prosecution case any further. It is a neutral circumstance and it is compatible both with his innocence as well as his guilt. So, he contends that in this particular case, the prosecution has not made out a case against the petitioner that he was drunk.

It may be pointed out that in the very next paragraph of the said judgment quoted above, their lordships of the Supreme Court observes as follows:

> *The onus thus cast on the prosecution may be light or heavy according to the circumstances of each case. The intensity of the smell itself may be such that it may negative its being of a permissible variety. Expert evidence may prove that consumption in small doses of medicinal or other preparation permitted cannot produce the smell or a state of body or mind amounting to drunkenness.*

Their lordships have stated that the intensity of the smell itself may be such that it may negative its being of a permissible variety. Expert evidence may prove that consumption in small doses of medicinal or other preparations permitted cannot produce the smell or a state of body or mind amounting to drunkenness. So from this it is clear that where there is expert evidence which proves that the consumption is not due to medicinal or other preparations, their lordships pointed out, that it is permissible for the prosecution to rely upon it and in such a case the *onus* cast on the prosecution is duly discharged.

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27. *Thimmiah v State of Mysore*, AIR 1967 Mys 83 : (1966) 1 Mys LJ 515 : 1967 Cr LJ 785 (Mys).
Also see: *State of Mysore v Billavara Kukkappa*, AIR 1960 Mys 312 : 1960 Cr LJ 1475 (Mys); *Harendra Nath Dass v State of Assam*, AIR 1967 Assam 56 : 1967 Cr LJ 1099 (Assam); *Palani Goundon (in re:)*, AIR 1957 Mad 546 : ILR (1957) Mad 66 : 1957 Cr LJ 976 (Mad); *Behram Khurshid Pesikaka v State of Bombay*, AIR 1955 SC 123 : 1955 Cr LJ 215 : 1955 SCR 613.
28. AIR 1955 SC 123 : 1955 Cr LJ 215 : 1955 SCR 613.; *Mahadevayya Veerabhadrayya Hiremath v State of Mysore*, 1966 Cr LJ 270 : AIR 1966 Mys 75.
Also see: *State of Maharashtra v Ramsingh Desasingh*, AIR 1963 Bom 68 : ILR 1962 Bom 493 : (1963) 1 Cr LJ 567.

The learned government pleader has argued that in the instant case the prosecution has proved the case against the petitioner and discharged the *onus* which lies on it. The case of the petitioner was that he had taken B.G. Phos and symptoms found on him were due to the fact that he had consumed that medicine. The learned government pleader argues that the evidence of the doctor P.W. 1 in this case definitely negatived the plea that the symptoms are due to his taking B.G. Phos. P.W. 1. Dr. Sangane Gowda when examined has stated that when the petitioner was produced before him he observed the following symptoms:

1. Breath smells of alcohol.
2. Pupils dilated and eyes are congested
3. Pulse 92 per minute.
4. Incoherent speech.
5. Staggering gait.

In the opinion of the doctor, the petitioner has taken alcohol and he was also intoxicated. He further stated that the petitioner was incapable of taking care of himself. In his cross-examination he has stated as follows:

> *..... I smelt only alcoholic smell. B.G. Phos. contains 17% of alcohol. If one takes in excess quantity he is not intoxicated. If the whole bottle is taken all the symptoms in a modified form exist. But he cannot have the smell of alcohol. Other symptoms will be there. A bottle of B.G. Phos contains 4 ounces of tonic. The intoxication lasts for 12 hours.*

It is clear from the evidence of the doctor that if a person takes the whole bottle of B.G. Phos, all the symptoms in a modified form will exist. He further states that if one takes in excess quantity of B.G. Phos he will not be intoxicated. There is therefore force in the contention of the learned High Court government pleader that the evidence of the doctor, definitely establishes that the symptoms found on the petitioner are not due to the fact that he had taken B.G. Phos. I am, therefore, of the opinion that the evidence of the doctor definitely disproves and negatives the case of the petitioner that he had taken B.G. Phos and the symptoms found on him were due to his taking excess dose of B.G. Phos. It follows from this that symptoms found on the petitioner were due to his taking alcohol and not B.G. Phos. I am, therefore, of the opinion that there is no merit in the contention urged by the learned counsel for the petitioner. The prosecution has established the charge against the petitioner.

13.10.12 BAC Test Rules/Procedure[29]

> *3. Mr. Bhatt next urged that if blood test rules are not properly followed, no presumption would be raised. He submitted that there is no evidence to show that the medical officer who extracted blood had used a sterilised syringe or that he had not applied alcohol or cleaned with sterilised water the skin of the accused before extracting blood. He urged that unless the medical officer categorically stated that he had followed all the rules scrupulously, no presumption could be made that he in fact had followed the rules. He, therefore, urged that these rules being mandatory, if they were not followed, no legal presumption could be made under section 66(2) of the Act. In support of his submission, Mr. Bhatt referred to the case of Vrajlal Damodar v State of Gujarat, (1971) 12 GLR 68 it was observed as under:*
>
> *It is, however, essential for the prosecution to prove two requirements prescribed by rule 4:*
>
> *1. viz., that no alcohol was allowed to touch the body of the person from whom the blood sample was collected; and*
>
> *2. that the phial in which the blood sample was transferred from the syringe contained anti-coagulant and preservative.*

29. *State of Gujarat v Ibrahim Mohmad*, 1975 Cr LJ 1089.

In my opinion, these two requirements constitute the essence of rule 4(1) and are mandatory having regard to the importance of complying with these directions and the nature and the purpose of such requirement. The next question that arises is as to how the prosecution can establish that the aforesaid requirements were conformed to. It would be sufficient for the doctor to say that he had complied with the requirements and followed the procedure prescribed by rule 4(1). General evidence of this character can be accepted as adequate to establish that the requirement was conformed to. Or, in the certificate issued by the doctor this fact of having complied with the requirement of rule 4(1) could be incorporated. These are two of the several possible ways of establishing that the rule was complied with. In the present case, the doctor has not been examined. For ought we know he may not have been conscious of the statutory requirement of rule 4(1). The certificate issued by the doctor, Ex. 5 also does not contain any statement that the requirement of rule 4(1) was present in the mind of the doctor who collected the blood sample or that he had complied with any such direction.

There can be no quarrel with the propositions laid down by my learned brother Thakkar, J., and with respect I am in entire agreement with his observations. But it should be remembered that in the case before him the doctor was not examined and the certificate did not disclose that the doctor had followed the provisions of rule 4(1). In the instant case, the doctor has been examined and the doctor has categorically stated that he extracted 5 c.c. of venous blood and collected it in a phial as per rules. My learned brother Thakkar, J., has stated that it would be sufficient for the doctor to say that he had complied with the requirements and followed the procedure prescribed by rule 4(1). I, therefore, fail to understand how this ruling would help the accused. In my opinion, it is not necessary for the doctor to repeat parrot like the provisions contained in rule 4(1). If the doctor is aware of the provisions contained in the Bombay Blood Test Rules and if the doctor in his evidence before the court says that he had extracted blood as per the rules and if there is no cross-examination to the contrary, it cannot be presumed that the doctor had not followed the mandatory provisions contained in Blood Test Rules particularly rule 4(1). Similarly the other case referred to by Mr. Bhatt would not help him. In the case of Madhavarao Bhagwandas Kharade v State of Gujarat, 1971 Cr LJ 1626 : (1971) GLR 956 it was observed that:

the presumption under section 66(2) of the Bombay Prohibition Act cannot be drawn unless the mandatory provisions of rules 4 and 5 of the rules have been scrupulously followed. The Legislature must have in its wisdom provided the period of seven days for the blood sample to reach the testing authority with a view to see that there may not be any tampering with the blood sample collected or that the alcohol contents of the sample of blood may not increase if it was kept in possession of the medical officer or his subordinate for an unduly long period.

With respect I agree with the observations made therein. In the instant case, as already observed earlier, the medical officer who extracted blood was examined and he has stated that he had extracted the blood and collected it in a phial as per rules. Therefore, whatever provisions are contained in these rules were followed by him. It is not necessary for him to enumerate the rules in seriatim in his examination before the court. So far as the second objection taken in the case of Malahavarao Bhagwandas Kharade would not be applicable in the present case because the blood sample was sent to the C.A. on the same day. There was no delay on the part of the medical officer in sending the phial to him. In my opinion, therefore, both the rulings referred by Mr. Bhatt cannot help him.

13.10.13 Proper/Improper Collection of Blood Sample[30]

As observed by this court in *State v Sheshappa Dudhappa Tambade*,[31] there is nothing brutal or offensive or shocking in taking blood sample under the protective eye of law. Modern community living requires modern scientific methods of crime detection lest the public goes unprotected. Such scientific tests are necessary for proving the guilt as well as innocence of the accused. This is one of the well-recognised methods adopted in the crime detection all over the

30. *State of Maharashtra v Sheshappa*, 1981 Cr LJ 133 (HC).
31. *State v Sheshappa Dudhappa Tambade*, AIR 1964 Bom 253 : (1964) 2 Cr LJ 523 : ILR 1964 Bom 404.

world. In this context a reference could usefully be made to the following observations in para 9 of the said judgment:

> *We have pointed out before that the section itself contains limitations with regard to the procedure for extracting blood. The question as to whether the conviction of a person based on the result of the involuntary blood-test taken after extracting blood deprived a person of his liberty without due process of law guaranteed by the Fourteenth Amendment of the American Constitution arose for consideration in Breithaupt v Abram, (1957) 352 US 432 : 1 L.Ed. 2nd 448. The petitioner in that case while driving a pickup truck was involved in a collision with a passenger car. Some of the passengers of the car were killed and the petitioner was seriously injured. A print whisky bottle almost empty, was found in the glove compartment of the truck. The petitioner was, therefore, taken to a hospital and while he was lying unconscious, the smell of liquor was detected on his breath. On a request by the patrolman, and attending physician, while the petitioner was unconscious, withdrew a sample of about 20 cubic centimetres of blood by use of a hypodermic needle. Subsequent laboratory analysis showed that the blood contained about 17% alcohol. The petitioner was thereafter charged with involuntary manslaughter and in the trial, testimony regarding the blood test and its result, was admitted into evidence, despite the petitioner's objection. This testimony included the evidence of an expert that a person with 17% alcohol in his blood, was under the influence of intoxicating liquor. Although he was convicted, the petitioner did not appeal, but later he sought release from his imprisonment by a petition for a writ of habeas corpus. It was contended that the conduct of the state officers offended the "sense of decency" and that it was "brutal" and "offensive" and was therefore "shocking" to the "conscience". It was also said that the conduct did not comport with traditional ideas of fair play and decency. This argument was not accepted by a majority of the Supreme Court of the U.S. Mr. Justice Clark who delivered the opinion of the majority observed as follows:*
>
> *There is nothing 'brutal' or 'offensive' in the taking of a sample of blood when done, as in this case, under the protective eye of a physician. To be sure, the driver here was unconscious when the blood was taken, but the absence of conscious consent, without more, does not necessarily render the taking a violation of a constitutional right; and certainly the test administered here would not be considered offensive by even the most delicate. Furthermore, due process is not measured by the yardstick of personal reaction or the sphygmogram of the most sensitive person, but by that whole community sense of "decency and fairness". That has been woven by common experience into the fabric of acceptable conduct. The blood test procedure has become routine in our everyday life. It is a ritual for those going into the military service as well as those applying for marriage licences. Many colleges require such tests before permitting entrance and literally millions of us have voluntarily gone through the same routine in becoming blood donors.*
>
> *The majority opinion, therefore, was that a blood test taken by a skilled technician is not such "conduct that shocks the conscience". The court also observed that this may not apply to cases where there is indiscriminate taking of blood under different conditions or by those not competent to do so. It was also observed:*
>
> *Modern community living requires modern scientific methods of crime detection lest the public go unprotected.*

Mr. Justice Clark in conclusion made the following very pertinent observations:

> *As against the right of an individual that his person be held inviolable, even against so slight an intrusion as is involved in applying a blood test of the kind to which millions of Americans submit as a matter of course everyday, must be set the interests of society in the scientific determination of intoxication, one of the great causes of the mortal hazards of the road. And the more so, since the test likewise may establish innocence, thus affording protection against the treachery of judgment based on one or more of the senses.*

This was the view taken by the Supreme Court of the U.S. even when the challenge was under the Due Process Clause. So far as our Constitution is concerned, the courts are not required to go so far and determine whether a certain procedure established by law was brutal or offensive or shocking to the conscience and was, therefore, unreasonable. Infringement of personal liberty or life, if in accordance with the procedure established

by law, is not justiciable. In the Prohibition Act, which, as we have pointed out earlier, is brought on the statute book to effectuate the policy of Prohibition, the taking of blood is empowered to be done only by a registered medical practitioner. It is thus under the protective eye of the law. It is intended to help the scientific determination of intoxication and the results of the test may as well prove innocence as the guilt of the person. We are, therefore, unable to accept the view taken by the learned magistrate that section 129A of the Act is *ultra vires* Article 21 of the Constitution.

13.10.14 Drunkenness not Proved without BAC[32]

5. Apart from the oral evidence given by the witness of their impression regarding the accused having been drunk at the time of the driving, the prosecution case in that connection rests on the certificate given by the medical officer. Obviously, no blood test was carried out, nor was any urine test taken. In such circumstances Mr. Gangal strongly relies upon the decision of the Supreme Court quoted above. In that case also, the appellant was convicted of rash and negligent driving mostly on the basis of the certificate from the medical officer. The certificate showed alcoholic smell, unsteady gait, dilation of pupils and incoherent speech. The finding of the High Court that the appellant was drunk, was not confirmed by the Supreme Court by making the observations as follows:

It seems to us that on this evidence it cannot be definitely held that the appellant was drunk at the time the accident occurred.

While arriving at this conclusion, the learned judges of the Supreme Court took into consideration that the symptoms of gait being unsteady could very well be if a person is in nervous strain. The Supreme Court also observed that mere smelling of alcohol would not show that a man is under the influence of drinking. Unfortunately the Supreme Court has not spoken about the competitive reasons for holding dilations of pupils or the incoherent speech as not necessarily due to a person being under the influence of drink. It appears that in the opinion of the Supreme Court, when urine test and the blood test were not done symptoms mentioned in the certificate were not conclusive of proving that the appellant was, under the influence of drink. I suppose Mr. Gangal can take benefit of this ruling although an unhappy feeling arises whether all the four symptoms taken together do or do not always amount to a person being under the influence of drink.

There is no reliable oral evidence in addition to the certificate of the medical officer for speaking of the behaviour or of the actions of the present revision petitioner for concluding that he was under the influence of drink. As the matter stands, in view of the ruling quoted above, it would be difficult to maintain the finding that the petitioner was driving under the influence of drink. Consequently, the conviction under section 117 of the Motor Vehicles Act, will have to be set aside.

13.10.15 Intoxication as Defence[33]

And even if one were to take it that the accused persons had taken some liquor the question will still be whether the case falls under section 86, Indian Penal Code, which provides:

86. In cases where an act done is not an offence unless done with a particular knowledge or intent, a person who does the act in a state of intoxication shall be liable to be dealt with as if he had the same knowledge as he would have had if he had not been intoxicated, unless the thing which intoxicated him was administered to him without his knowledge or against his will.

The facts found in the present case do not bring the case under section 86, Penal Code and the finding of the learned judge is opposed to the law as laid down in '1920 AC 479 (A)' which was

32. *Kishanbhai Jinubhai Gavit v State of Maharashtra*, 1978 Cr LJ 829 : (1977) 3 UCR (Bom) 422.
33. *Amar Singh v State of Punjab*, (1977) 3 UCR (Bom) 422 : 1955 Cr LJ 305 (PB).

approved of by the Lahore High Court in Sheru v Emperor, 2 where it was held that evidence on drunkenness falling short of a proved incapacity in the accused to form the intent necessary to constitute the crime, and merely establishing that his mind was affected by drink so that he more readily gave way to some violent passion, does not rebut the presumption that a man intends the natural consequence of his acts.

13.10.16 Murder after Drinking[34]

But there is one important factor in this case which we think may be taken as an extenuating circumstance for giving a lesser sentence. P.W. 9 says in his evidence that all the accused appeared to have been drunk. It is also in the evidence of other witnesses that the 1st accused was fully drunk and that he sat on a boulder by the side of the dead body and even taunted P.W. 1 when handing over the ring of the deceased to him.

If they primed themselves with drink for the purpose of committing the offence, that circumstance cannot obviously be proved for mitigating the punishment. But the accused were manufacturing toddy illicitly and they must have been getting drunk every day. One of the previous incidents, which is suggested to be the motive for the offence had taken place two months prior to the incident and another 10 days prior to that. There is no specific evidence that they had prepared themselves and taken a drink to strengthen their minds, to commit the murder. It is more likely that after they got drunk and when they saw the deceased going to the field the night, they got the idea of doing away with him in a drunken state of mind and pursued him with weapons, which they must have had in their garden and committed the murder.

13.10.17 Murder or Homicide[35]

Under section 86 of Penal Code, the court had together from the attending general circumstances of the case the intents or the intention, paying due regard to the degree of intoxication. If the man was beside his mind altogether for the time being, it would not be possible to fix him with the requisite intention. But if he had not gone so deep in drinking and from the facts it could be found that he knew what he was about to do, that rule that a man is presumed to intend the natural consequences of his act or acts will apply. Ordinary drunkenness makes no difference to the knowledge with which a man is credited. Intention in many cases in an inference from knowledge, but there may be cases in which a person by reason of intoxication may under certain circumstances be incapable of knowing the nature of a particular act he commits, or that it is either wrong or contrary to law although his state of intoxication may not be such as to render him incapable of knowing the nature of his acts. In such cases, in determining the quality of the offence, evidence may be necessary of a specific state of mind which must be found as a fact and not assumed.

Where in a case in which accused was charged under section 302, apart from the bold statement in her cross-examination by a prosecution witness that the accused was heavily intoxicated and the fact that there was no evidence either positive or circumstantial to support the inference that accused was beside his mind due to intoxication, the case came squarely under section 302 and not under section 304.

---

34. *Boya Burranna (re:)*, AIR 1954 AP 46 : 1955 AWR 183 : 1955 Cr LJ 81 (AP).
Also see *Re Suruttayyan*, AIR 1954 Mad 523 : 1953 Mad WN 941 : 1954 Cr LJ 672 (Mad); *Basdev v State of Pepsu*, AIR 1956 SC 488 : 1956 SCR 363 : 1956 Cr LJ 919 (SC); *Prabhunath v State of Uttar Pradesh*, AIR 1957 All 667 : 1957 All LJ 572 : 1957 Cr LJ 1056 (All).
35. *State of Orissa v Matuba Barik*, 1978 Cr LJ 260.

13.10.18 Random Sampling[36]

In this appeal by the State of Gujarat it is contended that section 98 applies to the case. That section reads as follows:

> Whether any offence punishable under this Act has been committed,
>
> (a) any intoxicant, hemp, mhoma flowers, molasses, materials, still, utensil, implement or apparatus in respect of which the offence has been committed, shall be confiscated by the order of the court.
>
> * * * * *

The short question therefore is whether it can be said that in respect of the 1500 and old bottles, an offence punishable under the Prohibition Act had been committed. It is no doubt true that the person who was charged with committing an offence was found not guilty, but the question is not whether the accused has been successfully brought to book, but whether the offence in respect of the property has been committed or not. There is a distinction between the two. An offence may be demonstrated to be committed although the accused who committed it may not be successfully prosecuted. We may be given an example. Suppose in a house a vast quantity of contraband opium is found. The house-holder may get off because the opium was found from a place which was open and had access to strangers. He may get the benefit of doubt and be acquired, but it is clear that insofar as the opium is concerned, an offence must be deemed to have been committed, and if it is proved that the contraband article was opium, it would be remarkable that the order should be that the opium be returned to the householder. In these circumstances, on proof that the contraband article in respect of which an offence has been committed is proved to exist, the obvious course would be to confiscate it to the state. In the present case, the two bottles which were sent to the chemical examiner were said to contain alcohol although there was some doubt in the mind of the magistrate as to whether there was no chance of any malpractice. Be that as it may, here are the other bottles intact. There is some evidence to show that they were in the original packing and were a proprietary product. The manufacturer came as a witness and deposed that the liquids were bottled by him as a proprietary manufacture. In these circumstances, it would be fair to assume that all of them were of the same kind as the ones which were sent for chemical examination. However, an examination of random samples can be made and if they satisfy the court that the bottles contain contraband stuff the bottles can be confiscated. The order of the High Court is thus set aside, but instead of restoring the order of confiscation we order that a few bottles at random should be analysed and if contraband stuff against the Prohibition Act is found the whole stock shall be confiscated.

13.10.19 Correct Sampling[37]

If three separate samples were taken from three different bottles and one sample was sent to the public analyst, which was taken from one bottle and another sample was kept for the court, which was taken from another bottle and another sample given to the accused was taken from another bottle and if the public analyst comes to the conclusion that the sample is adulterated, there is every possibility that the *3rd sample which is with the accused or the second one which is sent to the court need not be* adulterated. Therefore, it is proper that the three samples have got to be taken from one container and one to be sent to the public analyst and one to be kept for the court and the third one to be given to the accused.

---

36. *State of Gujarat v Chinubhai Gopaldas*, AIR 1968 SC 1275 : (1968) 2 SCWR 431 : 1968 Cr LJ 1478 (SC).
Also see: *Gobardhan v State of Uttar Pradesh*, AIR 1959 All 53 : 1956 All WR (HC) 216 : 1959 Cr LJ 13 (All); *Madigo Boosena v State*, 1967 Cr LJ 1398 (SC); *State of Madras v Chinappa Pujary*, 1952 Cr LJ 703 (Mad).
37. (1978) Cr LJ (NOC) 125.

CHAPTER 14

EXPLOSIVES AND EXPLOSIONS

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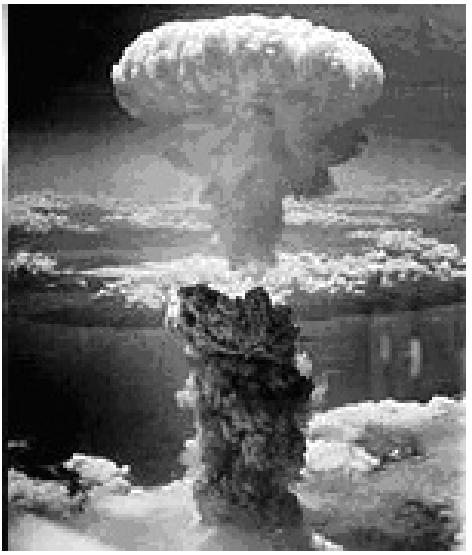


Fig. 14.1

Atom bomb cloud at Hiroshima in 1945, the first bomb explosion

Fig. 14.2
International pictogram for explosives

14.1 GENERAL

14.1.1 Explosives

For a common person, an explosive is a material that, on initiation, causes a sudden, almost instantaneous, release of gases, heat, light, and pressure, accompanied by the loud noise. The explosive material(s) may be a single entity or a mixture of two or more entities. It undergoes transformations. In the process, it releases a large amount of its potential energy, devastating/damaging the surroundings.

The government of India, in *Explosive Act, 1884 as amended in 1978*, has given the meaning of "explosive" materials fairly elaborately[1] in the following words:

> *Explosive means gunpowder, nitroglycerin, nitroglycol, gun cotton, di-nitro-toluene, tri-nitro-toluene, picric acid, di-nitro-phenol, tri-nitro-resorcinol (styphnic acid), cyclo-trimethylene-trinitramine, penta-erythritol tetra-mine, nitro-guanidine, lead azide, lead styphnate, fulminate of mercury or any other metal, diazo-di-nitro-phenol, coloured fires or any other substance whether a single chemical compound or a mixture of substances, whether solid or liquid or gaseous used or manufactured with a view to produce a practical effect by explosion or pyrotechnic effect, and includes fog signals, fireworks, fuses, rockets, percussion caps, detonators, cartridges, ammunition of all descriptions and every adaptation and preparation of an explosive as defined in this clause.*

14.1.2 Uses of Explosives

Explosives have many legitimate uses, both for civil and military purposes. In civil works, they are mostly used for:

1. Fireworks; on festivals and marriages and inauguration of mega events like Olympic Games, for coloured lights display, sound signals.
2. Mining of minerals.
3. Blasting obstructing rocks/earth; for the construct roads, railway lines, dams, tunnels, pipelines, buildings, and the like.
4. Spacecraft and satellite propulsion.
5. Oil explorations.
6. Extinguishing oil wells' fires.

1. Section 4 of the Explosive Act, 1884 as substituted by Act 32 of 1978, operative with effect from 2-3-1983.

A few years ago one of the oil wells caught fire. The firefighters struggled for 42 days to put down the fire but to no avail. Ultimately, the fire was put down by exploding 200 Kg of high explosive at the site. The explosion extinguished the fire. (CH)

7. Demolition of old derelict structures.
8. Ammunition for small arms: for hunting, self-defence or in armed conflicts.
9. Miscellaneous uses: for heating food, lifting loads, welding, drain blockage testing, tear gas shells to control mobs, and the like.

Defence forces of all countries use explosives in large quantities in their defence (and offence) systems, mainly for:

1. Ammunition for their small arms and artillery
2. Grenades, bombs
3. Smoke screens

14.1.3 Abuse of Explosives

The abuse of explosives is extensive. The terrorists misuse them to inflict heavy losses of life and property. They are exploited in sabotage, communal and political wrangling. They are abused for murders, dacoities/robberies, revenge killing, and burglaries.

A very rich person could spend lots of money on the wife of one of his friends, a military officer, when the latter was away on duty. The wife was so enamoured by the person that she abandoned the officer and started living with the businessman. The officer was cut to the quick. He wanted to take revenge. He allegedly sent a parcel bomb to the paramour. It exploded when he was opening it and killed him. The officer was prosecuted and the lower courts convicted him or murder but the apex court ultimately acquitted him of the charge. (CH)

The abuse of explosives, in India, was not common up to the late eighties of the twentieth century. They were used to open safes and money chests, sometimes. They were also used, but rarely, to derail the train to loot the passengers. The criminal usually used low explosives for the purpose. However, terrorists have completely changed the scenario.

The explosions by terrorists have become too common, killing and maiming scores of persons, destroying cars and buses and other property worth crores of rupees! The Mumbai blast (1993), Twin Tower blasts of New York (2001) and the continuing spate of suicide bombings in Pakistan and elsewhere (2017) are sad and painful examples.

Table 14.1

New York Twin Tower Blast Holocaust
(11 September 2001)

Persons killed	~ 3000
Repercussions	Started a limited War in Iraq/Afghanistan
Property Damaged/destroyed (Approx.)	$ 3 trillion
culprits	19 Al-Quida terrorist: all killed
Mastermind	Osama Bin Laden; killed in May,2011
Main Fall out	Iraq war
Type of Attack	Suicidal plane crash

What could be achieved by a non-explosive explosion? It was dramatically revealed in the twin Tower destruction on 11 September 2001:

1. *4 passenger aeroplanes were hijacked by 19 al-Qaeda terrorists on 11th September, 2001. Two of the planes, were crashed into the North and South towers, of the World Trade Center complex in New York. Within 2 hours, both 110-story towers collapsed, causing partial or complete collapse of all other buildings in the neighbourhood, including the 47-story 7 World Trade Center tower.*
2. *Brought USA to a grinding halt for days together*
3. *Pulled down the stock markets of the world*
4. *Brought in serious racial/religious conflicts*
5. *USA took about 11 years to hunt mastermind: Osama Bin Laden*
6. *The motives given were:*
    - *U.S. support of Israel*
    - *the presence of U.S. troops in Saudi Arabia*
    - *sanctions against Iraq*

Fig. 14.3

September 11, 2001 attack on World Trade Center: burning

Table 14.2

Mumbai Blast
(13 March 1993)

Criminal	Dawood Ibrahim's D company
Mode	13 car Bombs
Explosive	RDX with Sharpnels
Persons killed	257
Person injured	713
Property destroyed	27 Crores
Person accused	204
Time taken for investigation/trial	>20 years

Terrorists are abusing explosives increasingly for sabotage, political and communal vendetta. The latest terrorism wave in Pakistan is a stern reminder to all about the shape of things to come.

Table 14.3

October, 2009 Explosions in Pakistan

Date (attacks)	5	9	11	12	15: 3	16	20	23	26	28
Place	Islamabad	Peshawar	Army GHQ	Shangl	Lahore Police	Peshawar CIA	Islamabad Islamic University	Kamra Aeronauti-calcomplex		Pesha-war
Dead	5	54	19	41	27+11+ 1 = 39	15	7	9	2	117

The terrorist is using all means of transport to carry explosives to the targeted site. Human bomb was used to murder Rajiv Gandhi. Cycles, Scooters/motorcycles, cars, buses, trucks even aeroplanes (Kanishka of Air India!) have been used.

The main targets are usually trains, buses, hotels, government buildings, police stations and public places, army installations.

The reasons for the extensive abuse of explosives are:

1. **Easy availability;** of the explosives or their ingredients/components
2. **Easy improvisation;** of the explosives from common materials available in the markets; for example, ammonium nitrate, an important fertiliser, has been extensively exploited to manufacture Indigenous Explosive Devices (IEDs).
3. **Massive illegal supplies;** of high safe explosives (mostly RDX, TNT) to terrorists by the hostile neighbouring countries
4. **Cost-effective explosives**; the common active ingredients of the indigenous explosive devices are ammonium nitrate (a fertiliser), potassium chlorate. They are both cheap and easily available. Besides, the assembling of Improvised Explosive Devices (IEDs) does not involve high technical expertise.
5. **Easy to carry and hide**; common items are used as containers to hoodwink the observer. Ordinary suitcases, bags, transistor radio frames, postal parcels, cycles, cars and even trucks are used to carry, hide and explode bombs at the chosen sites.
6. **Sophistication in initiation;** has gone very high. Remote or delayed time initiations are quite common.

   An IED was placed in a waste paper basket in the office of a district police chief (an SSP). The device was exploded through a remote control gadget from a safe distance, outside the room, when the officer came to the office. The explosion killed the officer. (CH)

   Suicide bombing is the latest trend in the abuse of explosives. The new concept of the exploding human is quite abnormal, yet very effective. Suicide bombers (***Fidayeen***[2]), the human-initiator, have taken over the big job. What is the cost of the human-initiator is not known. But in term of grief to the members of the blown-off *Fidayeen* must be heart rending. The number of human-initiators is increasing, especially in Pakistan.
7. **Little residual evidence;** is left after the explosion, and that too is hidden and contaminated in heaps of debris that are left after the explosion.
8. **Create panic and fear;** among the victims and onlookers, which is the main objective of the terrorists.

2. Persons who have been motivated to die for a (misconceived) cause on conviction that they will go to heaven.

9. **Choice of time; and place**; the culprit chooses the time and place which are unpredictable and thus defy preventive measures. They create fear psychosis among a large section of the society. It affects public morale and efficiency.
10. **Effective in all crimes**; the explosives can be used and are effective in all sorts of crime. The terrorists have therefore, adopted them on a large scale
11. **Explosives are safe** to handle, store and use.

The abuse of explosives is a serious offence. The law provides stern punishments if the perpetrators are identified, apprehended and tried. However, very few terrorists live to face the trials. They die in the explosions, commit suicide if caught or their gang members kill them.

14.2 NATURE

An explosive is a substance, which on receiving an impulse undergoes rapid changes — decomposition or transformation to other forms, almost instantaneously. The process releases tremendous energy in the form of high-speed gases, light, heat and imparts kinetic energy to entities which come in contact with the expanding gases and other decomposition products. The decomposition and conversion of the explosive to other substance(s) are extremely rapid and self-sustained.

The explosive may be an element (Uranium), a compound (TNT, RDX) or a mixture (black powder, chlorate or nitrate mixtures).

The explosive substances, commonly encountered in the criminal investigation, are chemical compounds or their mixtures, ordinarily.

14.2.1 Characteristic Features

The main characteristic features of the explosives are:

1. **Chemical instability: a**n explosive substance is internally unstable. The instability of the substance leads to rapid decomposition or transformation on receiving an impulse.
2. **Self-sustenance: a**n explosive undergoes a self-sustained chemical/physical changes. It is usually rapid burning of the combustible component of the explosive compound or mixtures. Carbon, hydrogen and other elements in the explosive substance or mixtures provide fuel (combustible material) for the explosive charge. Likewise, the explosive has sufficient oxygen to support the combustion. They form part of the unstable compound or of a constituent of the explosive mixture, in combined form. On initiation, the oxygen supports the self-sustained chemical change. They create gaseous products and energy in various forms.

   In mixtures, like gunpowder, potassium nitrate provides oxygen to the combustion of the fuel components. Other oxidants can also be used. Nitrates, chlorates, perchlorates, nitrites, permanganates, chromates, and dichromates are other oxygen suppliers in explosive mixtures.

Certain explosives, like azides of metals (for example Lead Azide), do not contain oxygen. The decomposition of the molecules provides sufficient gas (nitrogen) and heat to give the explosive effect. The usual combustion does not take place.

Additional characteristics of common explosives are:

1. They are sensitive to one or more of the following energy impulses:
   - Friction
   - Impact

- Electric Charge
- Heat

2. Most of the common explosives have nitrogen as a component of the molecule. Nitrogen confers instability to the explosive substance.
3. Most of the explosives, after the explosion, leave very small amounts of residues.
4. Explosives can be improvised easily. The raw materials for their manufacture are easily available.
5. Explosives, on explosion, release gases and other products. The volume of the products is many times the volume of the explosive used.
6. Some explosive decomposes at a very high speed. They are said to detonate[3]. Other explosives burn at comparatively slow speed. They are said to deflagrate[4]
7. Nuclear explosions depend upon annihilation of matter for their explosive action. They occur with unstable atoms, which undergo decomposition in a chain reaction, producing intense heat, light and radiation. The surrounding gases expand suddenly and cause an explosion.
8. In a thermonuclear reaction, hydrogen gas atoms (or other substance) 'fuse' to form helium atoms (or other substance). This happens at very high temperatures, generated by nuclear decomposition. The fusion reaction also results in the annihilation of matter, which is converted into heat, light and other radiation energy to cause an explosion.
9. Aerosol explosions occur when combustible gas (from gas cylinders or other sources), vapours of inflammable liquids (like petrol), other combustible gases and organic dust (like flour) form explosive mixtures with air under certain conditions.

The explosion of the twin towers of the World Trade Centre, in New York, on 11 September 2001, is a revelation. No normal explosives were used. The fuel of the two passenger aircraft, which struck the buildings, exploded and destroyed not only the second tallest buildings of the world and killed thousands of persons, but also created the great panic among the people.

14.3 CLASSIFICATION

14.3.1 Legal Classification

The explosives have been classified in *The Explosives Rules, 1983, Sch I* as under:

Table 14.4
Classification of Explosives

1. Class 1	Gunpowder
2. Class 2	Nitrate Mixture
3. Class 3	Nitro Compound
4. Class 4	Chlorate Mixture
5. Class 5	Fulminate

3. **Detonation** is burning of high explosives at supersonic velocities (up to 2,000 m/s)and very high pressure (up to 20 bars).
4. Deflagration propagation velocity is about 199 m/s. The pressure developed is also low: about 0.5 bars.

6. Class 6	Ammunition
7. Class 7	Fireworks
8. Class 8	Liquid Oxygen Explosives (LOX)

The classification is rather loose but convenient from the legal point of view. Other classifications are based upon various features of explosives as under:

14.3.2 Speed Based Explosion

Speed of explosion divides explosives into two classes:

1. **Low or deflagrating explosives; their** burning speed is 200 to 900 m/s. It may go up to 2000 m/s.
2. **High or Detonating Explosives;** their detonating speed is 2000 to 9000 m/s.

14.3.2.1 Low/Deflagrating Explosives

Strictly speaking, low explosive burn rather than explode. The burning process is rapid (200 to 900 m/s). They produce gases rapidly, which increase pressure on the surroundings in confined spaces. Common deflagrating explosives are:

1. Gunpowder
2. Nitrocellulose and
3. Cracker compositions are usually low explosives.

The low explosives are utilised to manufacture propellants for small arms, fireworks. They are safe if properly manufactured, handled and controlled.

Low explosive, however, can behave like high explosive under certain conditions. For example, gunpowder initiated in closed containers can act as a high explosive.

14.3.2.2 High/Detonating Explosives

High explosives explode at very high speed: 2000 to 9000 m/s. They shatter the container and have a shattering effect on the surroundings. The explosive wave is directional. It takes the direction least resistance.

Common high explosives and their detonation speeds are in the table below:

Table 14.5
Detonation Speed of Explosives

Explosive	Detonation Speed (m/s)
1. TNT,	8250
2. RDX,	8180
3. PETN,	8300
4. Tetryl	7850
5. Amatol	6430

14.3.3 Sensitivity Based Explosives

On the basis of sensitivity, the explosives are divided into two classes:

1. **Primary Explosives**
2. **Secondary Explosives**

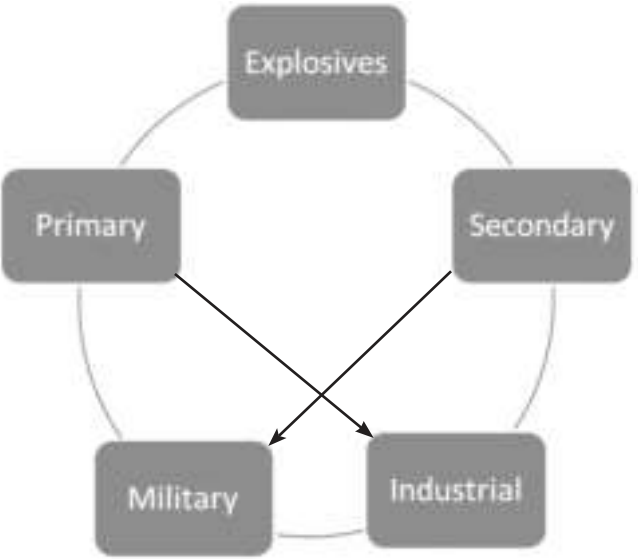


Fig. 14.4

Explosives and their applications

14.3.3.1 Primary explosives

Primary explosives are highly sensitive to various stimuli: impact, heat and friction, and are easily initiated with an electric spark or direct flame. They detonate; they do not deflagrate. They are used in small amounts as initiators in firearm ammunition, blasting caps and detonators or to initiate, sensitise and explode the secondary explosives. The latter form the main charge of powerful explosive devices. The primary explosives are initiated by impact by an electric spark or by stabbing the primary charge.

Working with primary explosives in substantial quantities is hazardous because of their high sensitivity.

The important common primary explosives are:

1. Mercury fulminate
2. Lead/Silver azide
3. Lead styphnate
4. Tetracene (tetrazene)
5. Dinol (Diazo-dinitro-phenol)

14.3.3.2 Secondary Explosives

Secondary explosives are comparatively insensitive. They are safer to manufacture, transport and work with *vis-à-vis* the primary explosives. They normally require a small charge of primary explosive as a detonator to explode.

The common secondary explosives are TNT, RDX, HMX, PETN.

14.3.3.3 Tertiary Explosives

Tertiary explosives (blasting agents,) are, insensitive to shock. They need booster (secondary explosives) for their explosion. They are safe to work with and are comparatively very cheap. Therefore, they are used extensively, especially in mining and construction activities. ANFO is a tertiary explosive which is used almost exclusively in these two activities.

14.3.4 Use-Based Classification

The third classification of explosives is based on their use, abuse:

1. Industrial Explosives
2. Military Explosives
3. Pyrotechnics
4. Propellants
5. Non-explosive Explosive mixture
6. Nuclear Explosive
7. Miscellaneous

14.3.4.1 Industrial Explosive

14.3.4.1.1 Dynamites; industrial explosives were loosely termed as **dynamites**. They are modifications of the original dynamite, which, Alfred Nobel prepared from nitroglycerin, a highly sensitive powerful and cheap liquid explosive. The sensitivity of the explosive is so high that it does not permit safe handling during its use. Nobel reduced its sensitivity in a very simple way; simply by adding Kieselguhr earth (diatomaceous earth) to nitroglycerin. He found that a mixture consisting of 25 parts of nitroglycerin and 75 parts of the earth gave the best results. The results brought in lots of money with which he created a trust, which has been awarding Nobel prizes for the globally best contributions in various fields of activity.

A number of formulations with or without nitroglycerin have come up and 'dynamites' are being manufactured according to those formulations. Common formulation are given in the table XVIII-6.

Table 14.6
Dynamites

Name of Dynamite	Composition
1. Straight Dynamite	NC (Nitrocellulose) + EGDN (Ethylene Glycol Di-Nitirite)
2. Gelatine Dynamite	NG (Nitroglycerin) + EGDN + NC

14.3.4.1.2 ANFO (Nitrate Mixtures) Dynamites are no longer the favourite industrial explosives because of their accidental potential. ANFO explosives have replaced them. They contain ammonium nitrate as the main active explosive ingredient. They are commercially available emulsions, slurries or gels.

ANFO contains Ammonium Nitrate (94%) and Fuel Oil (6%). It is the most popular and widely used commercial explosive. It is cheap, safe, and easy to handle, yet powerful. A number of formulations have come up for ANFO explosives.

14.3.4.1.3 Gel Explosives; they occupy a predominant position among industrial explosives. They are used as blasting agents.

Gel explosives have a jelly-like consistency and they are packed in plastic tubes, like sausage. Both the ends of the tube are closed.

Gel explosives are made from ammonium nitrate, calcium nitrate, aluminium, ethylene glycol and TNT. The proportions of these components vary depending on the desired explosiveness of the water gel. They are often sensitised by a number of materials like Aluminum powder, TNT, PETN, RDX. Gel explosives have many advantages over the traditional explosives collectively called dynamites, including the following:

- They are less hazardous to manufacture, store, transport and use.
- They are less toxic.
- They are cheaper.

They are known by a number of names, most frequently used names are:

- Water Gel Explosives
- Slurry explosives
- *Explosive Emulsions.*

The water gel explosives do not contain NG. They are solution of nitrates containing water (15%). The following are the main ingredients of water gel explosives.

- Ammonium Nitrate
- Calcium Nitrate
- Sodium Nitrate

In addition, they contain stabilisers and gel forming agent. Some water explosives also contain Aluminum (for energy), TNT or aliphatic amine nitrate (for sensitization).

Slurry explosives are essentially ammonium nitrate explosives turned into slurry by the addition of water and a gelling agent. Sometimes sensitising agents are also added.

Explosive emulsions are usually made of inorganic nitrate, Ammonium or Sodium Nitrate (AN or SN) mixed with fuel oil, wax and emulsifier. The mixture is made sensitive with air bubbles (through tiny plastic bubbles). In some preparations Nitrocellulose (NC) and Ethylene Glycol Dinitrate (EGDN) are also added for sensitisation. Two typical formulations are:

1. **Nipak:** Ammonium Nitrate + Sodium Nitrate + Tetrachloride+ polyurethane + Aliphatic amine nitrate with plastic bubbles.
2. **Emulex:** AN+SN+AL + oil with emulsifier + microbubbles.

Industrial explosives are mainly used for blasting, mining. Important members are dynamites of various compositions (and strengths). Examples are Gelatins, Gelignite and ANFO.

Emulsion explosives are popular for blasting purposes. They have high speed because of their particle size. They can be used in wet or water-filled holes, as they are also available in waterproof form.

14.3.4.2 Military Explosives

Military explosives are mainly TNT, RDX, PETN, Tetryl, HMX. The first three are the most popular. Military explosives are usually used in mixtures.

Table 14.7
Military Explosives

Name		Composition
1. A-3	=	RDX + Wax
2. B	=	RDX + TNT + Wax
3. C-1	=	RDX + Plasticiser[1]
4. Cyclotol	=	RDX + TNT
5. PTX-1	=	RDX + TNT +Tetryl.
6. PTX-2	=	RDX + TNT + PETN
7. Pentilite	=	PETN + TNT
8. Terytol	=	TNT + Tetryl
9. Tritnol	=	TNT + AL
10. Picratol	=	TNT + Am. Picrate
11. Octol	=	HMX +TNT
12. Delta sheet	=	PETN + Platiciser

The variety of military explosives is legion. The number is increasing. The compositions and formulations also vary, not only with different brand names but also with various batches of the same explosive mixtures. Most formulations are secret.

14.3.4.3 Pyrotechnics

Pyrotechnics are an explosive mixture to create fireworks display. The main ingredients used are mainly gunpowder, aluminium powder, barium nitrate, magnesium powder, nitrate mixtures. A large variety of pyrotechnic items is available in the market and new products come up continuously. Only licensed persons can manufacture them. However illegal manufacture goes on.

Before pyrotechnic products go to the market the authorities inspect the products. Each product has to conform to the specifications laid down by the Chief Controller of Explosives *vis-à-vis* its composition and structure. The nature of the explosive as well as the quantity of the explosive used has to conform to the directions of the authorities. In fact, the pyrotechnics item of a firework product leaves the premises only after the approval of the Inspector of Explosives.

The use of chlorates mixtures is prohibited in fireworks.

The pyrotechnics are supposed to be innocent items for fireworks display on festivals, birthdays, marriages and other celebrations. However, the manufacturers frequently cross the safety limits in order to increase the popularity of their brands.-p

Unlicensed manufacturers are often negligent. They do not hesitate to produce dangerous accident-prone fireworks. They sometimes cause serious accidents. Further, the users are usually children. Most of them have a "could not-care-less" attitude. They worsen the situation still more serious. Hundreds of children suffer injuries every year. A stringent control on the manufacturer and vigilance on the part of parents is essential.

> *In a case of accident while playing with fireworks, a child of ten years lost both his eyes. He was playing with a legally manufactured, hence authorised, cracker.*
>
> *An examination of a number of crackers of the same make and model revealed that clay was used to plug the two ends of the paper tube forming the body of the cracker. A series of experiments with the crackers showed that due to excessive use of gum in the clay (not specified in law), it had hardened. Further, it was partially baked by the heat of the explosion.*
>
> *Experiments with the crackers showed that the pieces of the hard clay plugs flew to long distances, even to 15 metres; and in all directions. If these pieces hit any person in the eyes, they could cause serious damage to the eyes, as had happened to the boy.*
>
> *It appears that the hardening of the clay plug due to excessive use of gum-was responsible for the serious accident. (CH)*

14.3.4.4 Propellants

Propellants are used in ammunition and have been discussed in some detail elsewhere in this book.[5]

14.3.4.5 Aerosol Explosive Mixtures

Non-explosive and explosive mixture is formed by combustible gases like NG (Natural Gas), LPG (Liquefied Petroleum Gas), volatile inflammable liquids and combustible organic dust, when they are dispersed in the air in a confined space and a spark or flame is applied to the aerosol. Household gas (LPG) cylinders explosions are on the increase.

14.4 INDIVIDUAL EXPLOSIVES

14.4.1 Gunpowder

Gunpowder is perhaps the oldest explosive known to man. Its details are given elsewhere in the book[6]. In addition to its use as propellant in homemade cartridges and muzzle-loading guns, it is used in mining for blasting, in safety fuses or fuse cords, in crackers and fireworks. It is also used in IEDs.

Gunpowder is an intimate mechanical mixture of potassium nitrate (or sodium nitrate), sulphur and charcoal. It can be identified by identifying its constituents. When it is treated with water, nitrate is dissolved and can thus be separated and identified from the solution.

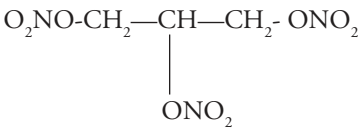
Potassium nitrate is identified from the colour of its flame (orange-purple) or by instrumental methods.

Residue after removal of potassium nitrate is stirred in pyridine, Sulphur is dissolved in the solvent. Filtration removes the charcoal from the sulphur solution. Evaporation of the solution gives sulphur It is identified from its colour, crystals and burning which gives sulphur dioxide. With sodium hydroxide solution, the filtrate gives tan-brown colour to indicate the presence of sulphur.

Charcoal is identified from its colour, non-reactivity and burning.

5. See Chapter 9. May also see chapter 3 of my book: ***Firearms in criminal Investigation and trials;*** 2017 Edn (V), LexisNexis.
6. *Ibid.*

14.4.2 Nitroglycerin [$C_3H_5(NO_3)_3$]



It is a pale yellow liquid. It is an extremely dangerous explosive in its pure form. It is not used as such. Its common modified forms used are:

- Cordite, a propellant. Its use reduces the life of the firearm's barrel.
- Dynamite
- Gelignite
- Gelatin
- Plastic Gelatin

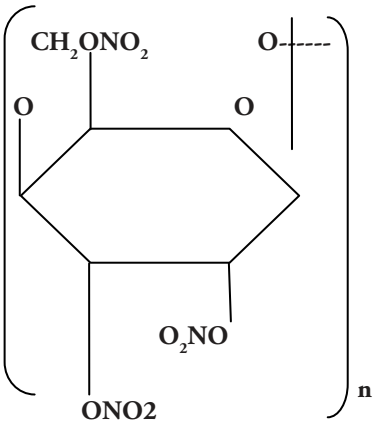
Modified nitroglycerin explosives are sold under a host of other trade names also.

Nitroglycerin is also used as medicine for heart and Angina Pectoris patients. It relieves the pain by reducing the blood pressure almost at once.

Nitroglycerin, when heated with sulphuric acid and mercury, gives nitrogen dioxide - a brown gas with a pungent odour.

Thin layer chromatography (TLC), using a silica plate with ether solvent, is used to confirm nitroglycerin. Sodium hydroxide spray followed by the spray of Greiss agent gives yellow to red colour spots.

14.4.3 Nitrocellulose (trinitrate)



Nitrocellulose, also known as gun cotton, is prepared from cotton or other cellulose by nitration. It has found extensive use in the manufacture of ammunition singly or in combination with nitroglycerin. As the latter has a tendency to corrode and damage the firearms, nitrocellulose is used alone in many propellant formulations.

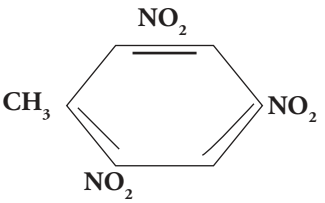
The maximum theoretical intake of nitrogen (in nitrate form) is 14.5%. However, explosive nitrocellulose contains slightly less than 13% nitrogen. Nitrocellulose with fewer quantities of nitrogen (~ 11%) is used for films, varnishes, lacquers.

Explosive nitrocellulose behaves both like a high or low explosive. When the quantities are large or it is exploded in a confined place, it explodes like a high explosive. In open

spaces and when the amount of the nitrocellulose is not large, it burns and behaves like a low explosive.

Nitrocellulose is identified through its solubility. It is insoluble in water, sparingly soluble in alcohol and easily soluble in acetone and certain esters. It is identified through TLC. The plate is coated with silica gel and acetone is used as a solvent. Water elutes the nitrocellulose. Sodium hydroxide spray followed by Greiss Reagent gives red spots.

14.4.4 Trinitrotoluene (TNT)



Trinitrotoluene is a high explosive. It is obtained by the nitration of toluene - a product obtained from coal tar or from petroleum.

It forms the major part of the bursting charge in many military explosives or explosive devices; either singly or in combinations with other explosives. Some of its combinations are:

- **Amonal**—it is a mixture of TNT, ammonium nitrate, aluminium and carbon.
- **Amatal** - It is a mixture of TNT and Ammonium Nitrate.

TNT is identified from its light brown colour. On identification of other substances, both explosive and non-explosive, formulation of the explosive mixture is ascertained.

TLC, with ether as solvent and silica gel as TLC plate coating (stationary phase) is used to identify the explosive.

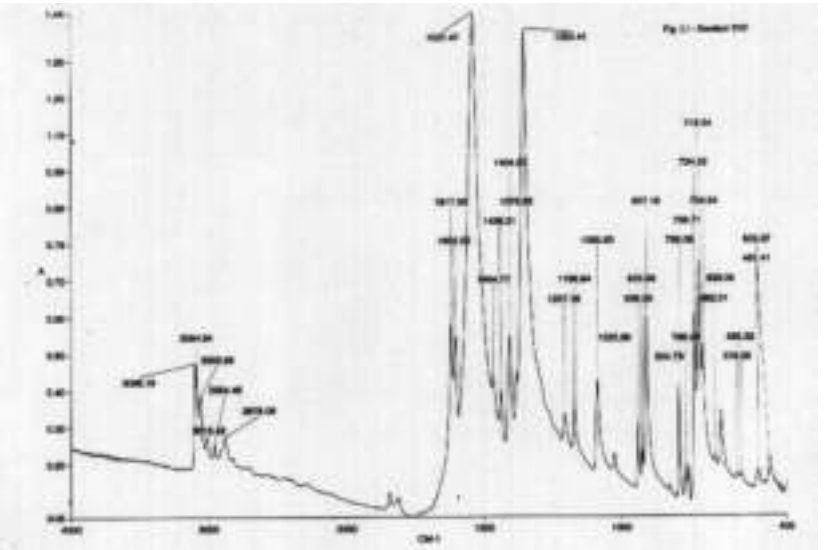
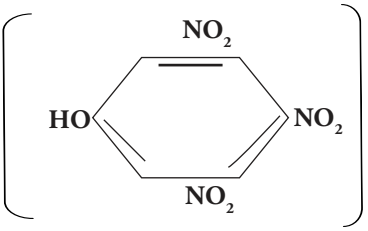


Fig. 14.5
TNT IR Spectrum

14.4.5 Picric Acid and Picrates

Picric Acid



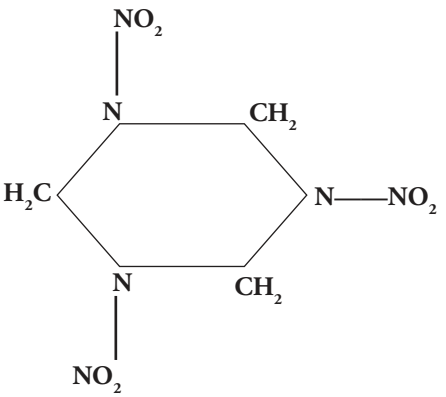
Picric acid is obtained by the nitration of phenol. It is yellow in colour. Its solution is used as a tincture. Picrates are derivatives of picric acid. The acid is ordinarily stored under water.

Picric acid and picrates are frequently encountered in homemade bombs. The explosion's products leave characteristic yellow stains on the objects around.

Picric acid and picrates are identified from their colour, melting points and derivatives with characteristic melting points.

Instrumental methods, TLC, IR, HPLC, XRD are particularly useful to identify/estimate picric acid and its explosives.

14.4.6 RDX (Research Department Explosive)



RDX or cyclonite is cyclo-1,3,5 trimethylene 2,4,6, trinitramine. It is one of the most important military explosives today. It is a highly stable high explosive. It is susceptible to shock.

RDX is used as a component of many formulations with TNT and PETN. Semtex is a plastic explosive created from RDX and PETN.

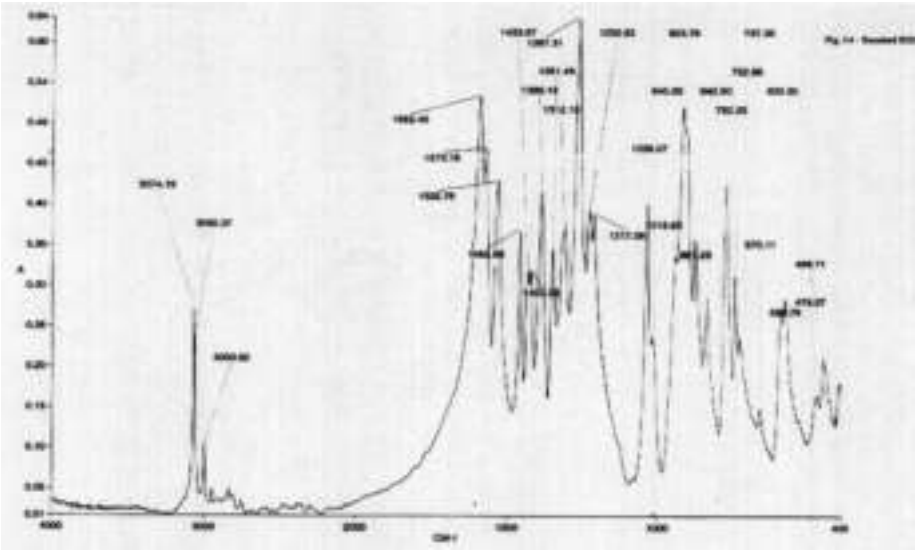


Fig. 14.6

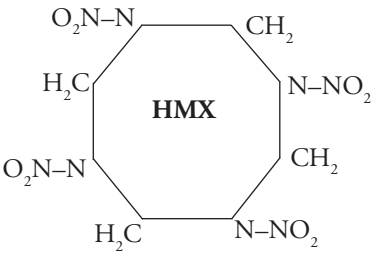
RDX IR spectrum

RDX in its various avatars has been used as military explosive now for a long time. Its abuse by the terrorists is comparatively recent, especially since rogue governments have started supplying it to their favourite terrorist groups. It has become popular with the terrorists. They are now using it routinely on a large scale.

RDX is identified easily:

- Spot test: 6-amino-I-naphthol and sulphuric acid gives yellow colour. Addition of ethanol changes it to blue, and then blue changes to grey.
- TLC, with acetone and silica gel used as the moving and stationary phases identifies RDX.
- IR spectroscopy identifies RDX. Its acetone solution or potassium bromide pellets (FTIR) give characteristic trace.
- X-ray diffraction, GC-HPLC, GC-MS are other techniques used for its identification.

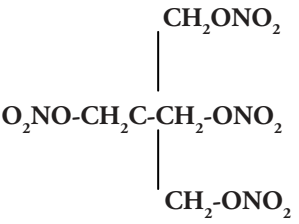
14.4.7 HMX



HMX is similar to RDX. Chemically it is *tetra*-methylene *tetra*-nitramine. The explosive is used as rocket fuel and also as a booster charge in artillery shells.

Its identification follows the RDX pattern: Spot test, TLC, IR, XRD are the method of choice. GC, HPLC, GC-MS techniques have also been used.

14.4.8 PETN ($C_5H_8N_4O_{12}$)



PETN

PETN is chemically *penta*-erythritol *tetra*-nitrate. It is a basic explosive charge for blasting caps and detonators. It is also used as an ingredient of booster charges, plastic explosives and detonating cord. It is also used in place of nitroglycerin for angina pectoris though mono-nitrate of glycerin is replacing the two.

PETN is highly stable. It is, however, highly sensitive to impact.

PETN does not give any good spot test. It is not easy to identify it through TLC either. The methods of choice are infrared spectroscopy or X-ray diffraction.

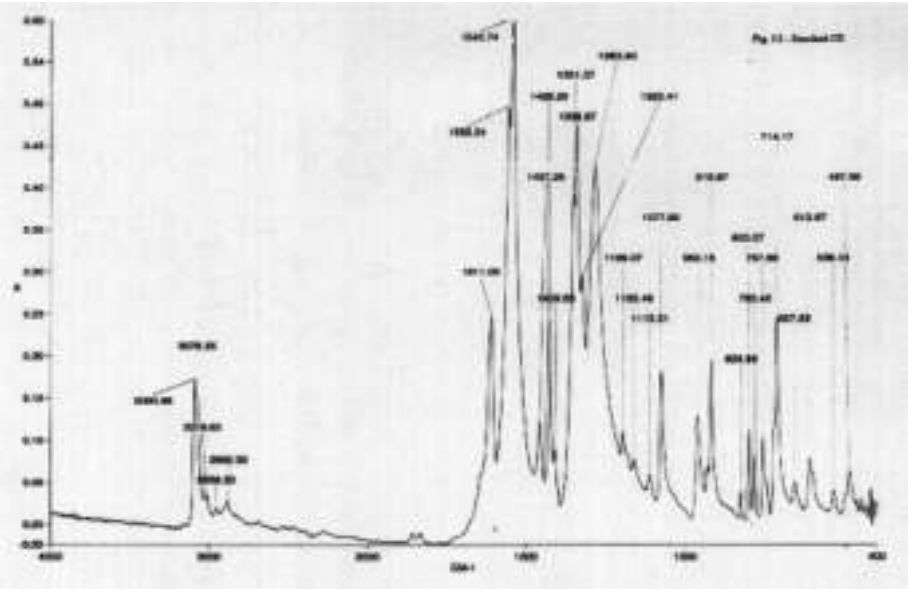


Fig. 14.7
PETN IR spectrum

14.4.9 Ammonium Nitrate (AN)

The main use of ammonium nitrate is as a fertiliser. However, it is an important component of many explosive formulations, especially in dynamites used for blasting purposes.

Ammonium nitrate is highly stable. It has low sensitivity to friction and impact. It is an explosive of choice for industrial purposes. It is a good oxidiser, provided the other components of the mixture do not react and change its characteristics. It is highly hygroscopic.

Ammonium nitrate alone can explode at about 20° C, if heated in airtight containers.

Ammonium nitrate is easily identified from the characteristic reaction of its ions.

14.4.10 Fulminates

Fulminates are primary explosives. They are highly sensitive to friction and impact. Consequently, they are very dangerous to handle.

Fulminate of mercury [Hg $(ONC)_2$] is used as an initiator in many explosive devices, firearm ammunition and in other primers.

14.4.11 Lead or Silver Azide

Lead and silver azides are high explosives. They are sensitive to pressure. Lead azide [$Pb(N_3)_2$] is used in percussion caps and other primers to initiate the main charge. The substance is not used as an explosive as such.

Lead and silver azides are comparatively more stable to heat and storage and less sensitive to impact than fulminates. They are compatible with most of the explosives.

Silver azide (AgN_3) is more sensitive than lead azide.

14.4.12 Lead Styphnate ($C_6HN_3O_8Pb$) H_2O

Lead styphnate is used as a primer in initiator compositions in various explosive devices and in percussion caps of firearm ammunition.

The explosive properties of styphnates are similar to those of lead azide or fulminates. Lead styphnate is non-hygroscopic and non-corrosive. It is, however, very sensitive to electric impulse or direct heating.

14.4.13 Tetracene (Tetrazene) $C_2H_6N_{10}$ (H_2O)

Tetracene is a highly sensitive explosive. It is stable to heat up to 75° C. It is used to sensitise primer compositions.

14.4.14 Dinol (DDNP) $C_6H_2N_4O_5$

The chemical name of dinol is Diazo dinitrophenol. The compound is less sensitive to impact, friction and electrostatic charge as compared to other primary explosives. It is the primer charge of choice for industrial explosives, blasting, caps.

14.4.15 Dynamites

Dynamites are frequently put to unlawful use. The culprits procure them from construction project contractors.

The dynamites have different compositions, which help to identify the source of dynamites. The usual tests (TLC, IR, GC and HPLC) are used to identify the organic constituents.

The constituents, which are used in the manufacture of dynamites include:

1. Nitroglycerin
2. Nitrocellulose
3. Ammonium Nitrate
4. Sodium Nitrate
5. Sulphur
6. Filler, which may be saw dust.
7. Oils

14.5 EXPLOSIVES DEVICES

There are too many explosives devices to permit their detailed discussion. Here only those devices are discussed which are sometimes involved in the criminal justice system.

14.5.1 Safety Fuses

Safety fuse is a train of black powder, like the lead of a pencil, enclosed and covered with cotton or jute threads or tape. There are ordinarily three layers of covering, but the number of layers and type of material used vary with different manufacturers. The outer layer is impregnated with moisture proof material varying from wax or coal tar to modern plastics. The powder is also enclosed in a rubber or plastic hose.

The burning speed of a safety fuse is controlled by the nature, grain structure, quantity and packing of the black powder. Usually it takes about seven seconds for the impulse to travel through one metre of a safety fuse.

Fig. 14.8
Cross-sectional view

Fig. 14.9

Longitudinal sectional view of a safety fuse

14.5.2 Detonating Cord

Detonating cord is also called Fuse Cord. It has a somewhat similar function and structure to that of a safety fuse. But instead of gunpowder PETN is used as the impulse carrier and the cover is usually a plastic hose. It is used to connect and initiate a number of explosive devices and charges simultaneously. It is also used in non-electrical detonators. It is shockproof.

PETN is a high explosive. It detonates at a high speed of about 5000 m/s. It produces burns mark on the surfaces where the cord was placed. The marks remain identifiable for a long time. The mark also indicates the site where the detonating cord was placed to cause the explosion.

14.5.3 Primers

Primers are essential initiating devices used in small arms and artillery ammunition. The initiating charge in the primers of small arm consists of:

1. A sensitive primary explosive: Mercury fulminate, lead azide or lead styphnate; the last being the favourite.
2. An oxidising agent (potassium chlorate), and
3. A combustible material (antimony sulphide).

The initiating charge is placed in a percussion cap and covered with waterproof lacquer in small arms ammunition.

The artillery primers are bigger in size. In addition to the initiating charge, they contain black powder to boost the initiation of the main explosive charge.

14.5.4 Military Detonators

Military detonators initiate and explode larger charges. Ordinarily, a detonator consists of a metal tube closed at one end. It is about 25 mm (one inch) long and about 6 mm (a quarter of an inch) in diameter. The detonating charge is placed first in the tube and covered by primary explosive. A high explosive (tetryl) tops the two.

Military detonators are also known as blasting caps.

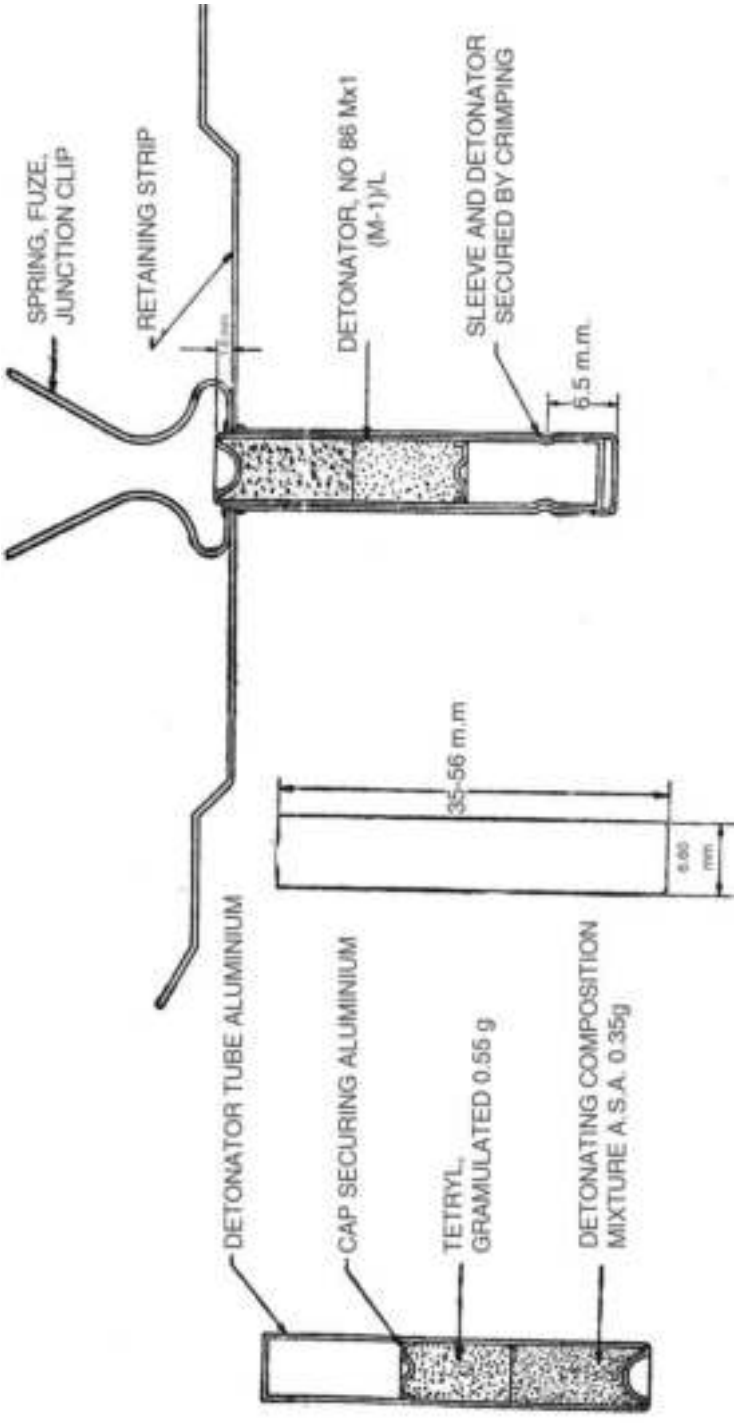


Fig. 14.10
Disruptive Detonators

14.5.5 Commercial Detonators

Commercial detonators are also known as blasting caps. They are similar to the military detonators with the following components:

1. Usual initiating charge is lead azide.
2. Common detonating charge PETN.
3. Container tube is of aluminium, brass or copper.
4. The detonating cord or electric lead wires are crimped into the container.
5. A small electrical heating element, placed in the initiating charge in the detonator tube. On switching on the current, the heated element ignites the initiating charge, which in turn detonates the main charge.
6. Alternatively, one end of a fuse cord placed in the initiating charge. The other end is set on fire. It ignites the charge, which in turn detonates the bursting charge.

The blasting cap is shattered in the explosion. Bits of the container tube and the marks of the burnt fuse are found at the site.

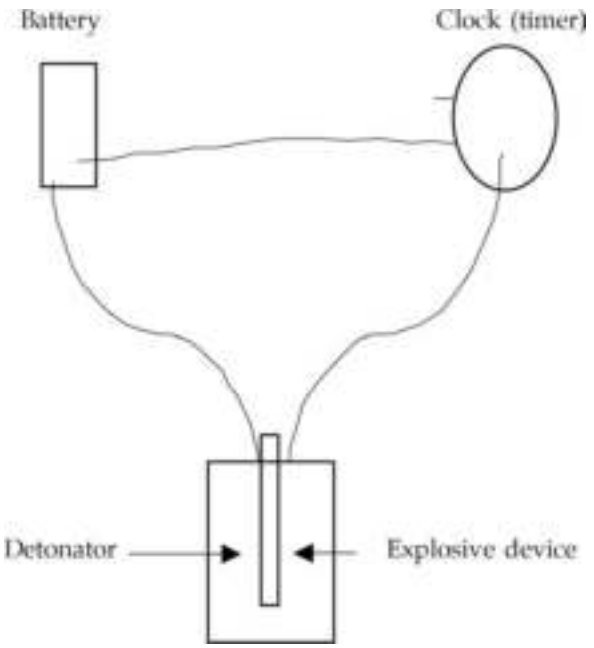


Fig. 14.11

Delayed Explosion setup

14.5.6 Explosive Train

An explosive train is an arrangement of different explosives of varying sensitivity and power to achieve proper initiation and detonation of the main charge to achieve the maximal explosive effect of the given explosive with maximum safety.

The train has essentially three parts:

a. The firing device.

b. The detonator and the booster charge.

c. The main bursting charge is contained in a shell of specific design.

The arrangements, however, vary tremendously in accordance with the nature of the explosive device.

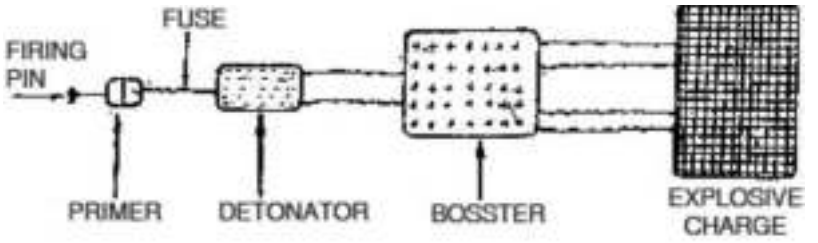


Fig. 14.12

Explosive Train Arrangement in High Power Bombs and other Explosive Devices

14.5.7 Grenade

A grenade has an explosive charge, an initiating charge, and an initiation device, all contained within a case of cast iron. On explosion, the case shatters into splinters and fragments. The splinters act as missiles and injure persons around the area (of a circle about 20 m in radius) where the grenade explodes.

The initiating device is a primer cap. The trigger is in the form of a lever, which is held along the case with a pin. When the grenade is to be used, the lever is released. It is actuated by a spring. The lever flies upward and the hammer thereon strikes the cap. The primer mixture gives out a flame, which ignites a safety fuse, kept in the cap. The other end of the fuse initiates a detonator kept in the main explosive charge (usually TNT or Baratol). The charge explodes and bursts the grenade.

The safety fuse has a specific length to delay the explosion. Usually two lengths are used. One delays the explosion by about 4 seconds and the other by 7 seconds.

A grenade can be thrown to a range of about twenty metres. It is dangerous in an area of a circle of about the same radius (20 metres).

The complete initiating device is one separate piece. The piece is kept away from the grenade during storage. The grenade is safe if the initiating device is not fitted in the body of the grenade.

To make the grenade functional, the initiating device is screwed to the main body of the grenade with the base plug. The grenade is ready for use.

Grenade is an anti-personnel device, generally hurled manually. However, it can be fired from a rifle (say 7.62 mm) specially adapted to fire grenades.

The manual hurling range of a grenade is about 20 m (23 to 27 m). The range is about 180 metres when fired from a rifle. It explodes into 40 to 60 fragments, killing and maiming the enemy within an effective radius of 27.5 meters.

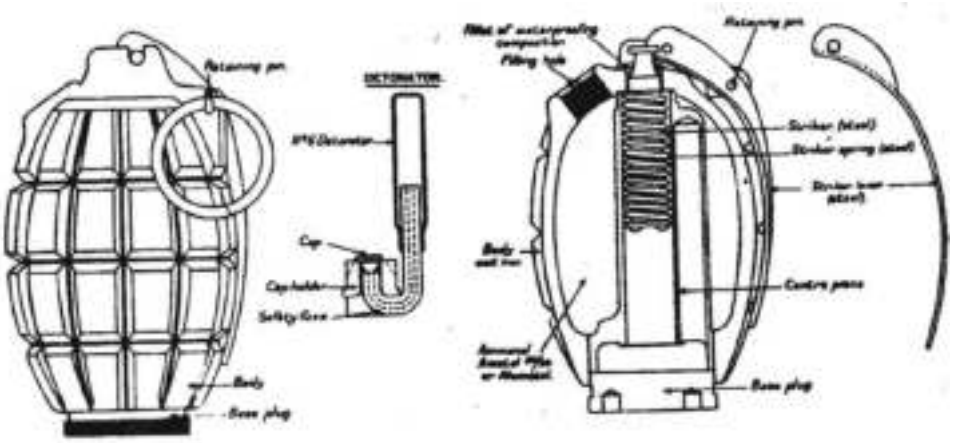


Fig. 14.13

Sketch of a Grenade. The Various Parts are Indicated in the Figure

The Indian grenade has the following specifications:

1. Body: round cast iron segmented
2. Main explosive charge: TNT
3. Detonator time lag: 4 seconds for hand grenade; 7 seconds for rifle grenades
4. Weight 680 grams

14.5.8 Military Bombs and Shells

The variety of military bombs and shells is very large. It is increasing every year. They are made to rigid specifications. In general, they are structured on the basic principle of the explosive train. Excluding hand grenade and mines military explosive devices are rarely encountered in police work.

Military bombs and explosive devices are easily distinguished from homemade bombs (IEDs) the following characteristics help:

a. All military bombs have good finish.

b. They bear identification marks: make, year of manufacture. The marks may be letters, logo figures or monograms on various parts of the device.

c. They have an appreciable size, except for the anti-personnel mines and detonators.

14.6 IMPROVISED EXPLOSIVE DEVICES

There is an infinite variety of crude improvised explosive devices (IEDs). They do not conform to any pattern or design. In fact, the nature of the contraption depends upon the ingenuity of the culprit and on the availability of materials which form components of the device.

14.6.1 Basic Components of IEDs

The essential components of an IED (homemade bomb) are:

1. A container
2. An explosive

3. An initiation device
4. Missiles
5. A timer in time bombs

14.6.1.1 Containers

The containers of crude bombs vary tremendously. Strings, paper, cloth, bottles, bulbs, tins, torch covers, bamboo poles, coconut shells, earthen pots and pipes have been used. They are used, usually, for bombs of small size, weighing less than a kilogram.

The terrorists have brought in new types of containers for IEDs. Some of them are:

1. **Transistor Bombs; i**n these bombs, the casing of a transistor radio, its electrical circuits and switches are used as essential components. These bombs are planted at busy places. They are supposedly left by some careless owner.

   When a person picks up and fiddles with such a device, the explosive inside explodes and kills the handler and other persons who happen to be nearby.
2. **Suitcase bombs; i**n suitcase bombs, suitcase forms the container. They house the explosives, the missiles, the initiating gadget and the timing device, usually a clock mechanism. They are placed at the intended targets, like cars, buses, trains, aeroplanes, buildings. The infernal device explodes at the set time and takes a toll of life and property. In the meanwhile, the terrorist vanishes from the scene. The power of these time bombs has varied, depending on the maker's ingenuity/intention.
3. **Human Bomb; h**uman bomb are also called suicide bombers. They were initially used to kill important leaders. A human bomb killed Rajiv Gandhi, a former prime minister of India on May 21, 1991, along with more than a dozen persons. Now, they are used for all types of targets.

   A spate of human bombs in Pakistan, using all sorts of modes, has been inflicting heavy loss of life and property on the population in recent years. It has greatly unnerved the Pakistan government. The spate continues unabated.

14.6.1.2 Explosives

The explosive is the most important constituent of an IED. It may be any of the following substances:

1. Military or commercial explosives
2. Small-arms propellants
3. Nitrate mixtures; nitrates of ammonia, barium, potassium are often used because of their easy availability.
4. Chlorate or permanganate mixtures; they are used in the same way as nitrate mixtures, often with more disastrous results. The mixtures are also used as initiators for fires and other explosives. For example, a mixture of potassium chlorate and sugar catches fire immediately on coming into contact with sulphuric acid.
5. The highly inflammable organic liquids; they have excellent explosive properties. The famous (or infamous) Molotov cocktails contain only petrol. Aviation turbine fuel of two aeroplanes acted as the explosive to destroy the World Trade Towers, New York in 2001.

14.6.1.3 Traditional Initiation Devices

The initiation devices on IEDs vary tremendously. The common ones are.

1. **Mechanical**: fall, crushing, impact, friction
2. **Shock**: induced by other explosions
3. **Heat**: flame, steam, exhaust pipe emissions
4. **Spark**: flame, cinders
5. **Chemicals**: for example, sugar-chlorate-sulphuric acid mixture
6. **Miscellaneous**: light, infrared rays, laser, ultrasound waves
7. **Electric current**

14.6.1.4 New Initiation Modes

1. **Radio waves; t**hey may actuate an electric circuit, which starts the explosion.
2. **Trip wire; a** wire may be arranged in such a way that if it is tripped upon, it makes or breaks an electrical circuit to actuate the initiating mechanism.
3. **Remote control;** remote control devices are being used to initiate explosive devices. They function on the same principles as a remote control device in the television set. They complete an electrical circuit and initiate the infernal device. Remote controlled electronic devices have become common with the hi-tech terrorist. The devices are available which can initiate explosion even from kilometres.
4. **Capsule initiation; a** capsule filled with sulphuric acid is kept in a sugar chlorate mixture. On the corrosion of the capsule, the acid comes in contact with the mixture and starts a fire, which, in turn, initiates the explosive device.
5. **IR sensors;** there are used in electronic timers. They are quite popular for short-range initiations.
6. **The trip wires**; they have also been used to blow up vehicles on the road, in parking places or on railways tracks.
7. Mobile phone; an ordinary mobile phone was used to initiate the Bali nightclub explosions which killed a large number of tourists
8. **Miscellaneous; t**he improvised initiation device may include an anti-handling mechanism. As soon as the device is handled, it explodes. The handling may actuate chemical mixing, mechanical spring or an electrical switch and starts the explosion. The variety of mechanical devices is legion and unlimited.

   Other types of initiators utilise photoelectric devices, sound operating switches, changes in temperature and moisture.

14.6.1.5 Missiles

All sort of materials, including stone pieces, ball bearing, small iron pieces, nails have been used as missiles.

Shattered pieces of containers also form missiles of the IEDs.

Fig. 14.14
Nail as missiles found in an IED

14.6.2 Improvised Explosive Devices

The following are the common types of IEDs encountered in police work.

14.6.2.1 Throw-downs

Throw-down bombs are used frequently in India. They work on the same principle on which a similar throw-down cracker works. On throwing down, the bomb explodes due to initiation by the impact on a sensitive material kept inside. Suitable chlorate mixture, fulminates mixtures, other chemical mixtures are used to start the explosion.

Throw-down bombs are often balls of various sizes; the smallest effective bomb being over five centimetres in diameter.

14.6.2.2 Fuse Bombs

Fuse bombs are fitted with a safety fuse. The fuse is ignited before using the bomb. The fuse cord of convenient length is used so that it does not explode while being thrown. The lighted fuse puts the explosive charge on fire and the device explodes. This is the easiest and one of the safest arrangements for initiation.

14.6.2.3 Percussion Cap Bombs

In percussion cap bombs, the initiation of the charge is similar to that of a grenade. A mechanical arrangement is made to hit a percussion cap The exploded percussion cap puts the explosive charge on fire; directly or indirectly. This is rather a complicated

arrangement. The terrorists in Punjab, in the 1980s, sometimes used this mode to initiate the IEDs. They used percussion cap of standard ammunition along with a nail-hammer arrangement.

14.6.2.4 Time Bombs

Time bombs explode at a preset time. Clocks or watches are usually used to fix the time of explosion. Other modes like electronic timers also exist.

A time bomb using a clock to fix the time of the explosion is included in an electric circuit along with the initiator and a battery. One end of the wire of the circuit is connected to the metallic needle of the watch (usually the hour hand) and the other end at the hour digit or the site. When the hour hand touches the digit or the site, the electric circuit is completed. The current would activate/initiate/explode the explosive system. Suitcase bombs were usually time bomb.

A clock mechanism is the most accurate method of timing a bomb and can serve to start an explosion at any time within 12 hours. New electronic timers can fix the time of explosion even up to 18 months or more.

Other types of timing devices used are:

1. The alarm system of a clock can start an explosion if a primary explosive is placed on the gong where the hammer strikes.
2. Corrosion of a metal or plastic container and seepage of sulphuric acid into a sugar-chlorate mixture can initiate an explosion. Estimated of corrosion time can be used for timing the explosion. Alternatively, when a container is fully corroded, an electrical connection is made which starts the explosion.
3. A capsule filled with sulphuric acid is placed in a sugar-chlorate mixture. The acid corrodes the capsule walls, which trickles down and initiates the explosion.
4. Fuse cords have also been utilised for timing the explosion. However, the fuse cord gives a limited timing interval, only long enough to run away to a safe place. The rate of a slow burning safety fuse is about 70 centimetres per minute. Therefore, seven meters of burning fuse cord will give ten minutes.
5. Natural fibre strings have also been employed for a longer delay. However, smoke and burning smell can give away the device. Besides, rain and wind can also upset the arrangement.

   In an interesting case, a man was sleeping in his ground floor bedroom. The window of the room was open. His foe found it an excellent opportunity to kill him. He took dynamite sticks, fixed a string in the sticks and placed the sticks through the window, close to his head. He lighted the other end of the string and ran away from the site. However, burning smell woke up he intended victim. He got up with a start and saw the string burning. He pulled out the smouldering string and threw it out. Only then did he notice the dynamite. The smouldering end had reached quite close to the sticks. (CH)

14.6.2.5 Letter Bombs

In 1972 there was an international wave of letter bombs. The wave caused not only death and injuries to a large number of persons; worse still, it caused panic in the world. Fortunately the wave has since subsided. However, the novelty of letter bomb remains. It still pesters people, now and then.

A letter bomb is a booby trap. It has to pass as a letter or a postal packet. Consequently, it must have limited dimensions and weight. Yet the device must contain all the components of a booby trap: a container, an explosive, missiles and an initiation device.

The container is the letter or packet cover. As the package has to move through the postal process, it has to be safe through the postal process. The container and the contents, therefore, have to be carefully selected, arranged and packed.

It has been estimated that about fifty grams of high explosives is sufficient to kill or injure a person seriously from a distance of about fifty centimetres. When a person is handling a letter bomb, the distance is often less. Consequently, the quantity of fifty grams of the needed explosive can be placed in a letter bomb. It does not make the letter or packet too bulky or suspicious, especially if the explosive is placed in the form of a sheet cut to the size of the letter cover.

The main ingenuity of the culprit lies in the choice and arrangement of an initiation device. A host of modes has been used:

1. The explosive chosen is so sensitive that it explodes on rough handling.
2. A friction sensitive explosive is placed at possible tearing sites for opening the letter. The tearing process explodes the letter bomb.
3. Potassium chlorate mixtures are placed in such a position that they, at the time of opening, start the explosion.
4. A miniature percussion cap (or detonator) and spring operated hammer is placed in the postal parcel in such a way that the hammer, on opening the packet, strikes the cap and explodes the explosive.
5. On opening the letter or packet bomb, a tiny battery gives a spark and initiates the charge.

The world is so much used to postal letters and packets that nobody cares to note the address or think about the possibility of its being an infernal device, The following observations prove useful to identify a letter or packet bomb:

1. A letter bomb often does not bear the address of the sender. It is frequently unregistered and may be over stamped. It is often marked 'personal' 'confidential' or 'secret'.
2. The outer cover of a letter bomb may carry stains.
3. The letter or packet bomb may be oddly uneven. It happens when an electrical or mechanical device is used to initiate the explosion. Metallic objects, can be felt or seen inside the packet.
4. The letter or packet bomb may have a cardboard-like stiff material inside, but is heavier than a normal piece of cardboard.
5. The name and other words on the letter bomb may have been misspelled or written in capitals.
6. The letter bomb may give a smell of oil or perfume.

The above aspects of a letter are checked systematically:

1. Suspect all letters or parcels from unknown sources.
2. Do not open a letter or a packet until it is found safe.
3. Get expert help to handle a suspicious packet or parcel.
4. Scrutinise the letter visually and feel the contents manually for any incongruity. Presence of a rattling noise inside is odd. Ascertain the cause before opening the letter.
5. Examine the letter or packet in transmitted light using a strong yet cool source of light (the light rays filtered through special glass). It may indicate abnormal objects. Ascertain their nature before opening the letter or packet.
6. Observe the letter under ultraviolet light. It may reveal unusual suspicious spots on the letter or packet.

7. Get the packet checked with infrared rays. They reveal the content. Most of the Forensic Science Laboratories now have infrared image conversion devices. The nature of the contents of packet (letter) can thus be evaluated without opening the letter or package in some cases.
8. Get the packet X-rayed. They reveal opaque objects. Thus, if a letter bomb is examined (screened as at airports) the initiation metallic device is revealed in most of the cases. X-ray equipment is available in most of the hospital in addition to the Forensic Science Laboratories. Soft X-rays are used.
9. Take the suspected letter bomb to an open space. Place it in a pit of about one metre diameter and depth. Handle it roughly (shake, turn, beat and press) by a remote controlled device. A strong long staff is efficient enough in most of the cases. Give sufficient time for each process. The device will explode, if it is designed to explode.

If the above checks and rough handling fail to reveal the infernal nature of the letter bomb, open the letter cautiously. The guiding principles in opening a suspect letter are:

- cover about 90-95% of the surface of the letter with a heavy book.
- cut open all the edges with a thin wooden (bamboo) strip in turn.
- employ minimal force to cut or separate the edges and extract the contents
- open the letter/packet cautiously and slowly. Haste can cause an explosion.

14.6.2.6 Transistor Bombs

Terrorists have used transistor bombs in recent times. The terrorists would leave such bombs in public places where someone would pick them up and fiddle with them. The bomb would explode killing the fiddlers and nearby persons.

In transistor bombs, the body of the transistor is used to house the explosive and missiles. The off-on switch serves to initiate the bomb electrically.

14.6.2.7 Magnetic Bombs

Magnetic bombs are usual time bombs having a moderately powerful magnet attached to the device. The magnet helps to fix the bomb to the car of the victims. The bomb would explode at the prefixed time, blowing the car to pieces and killing the persons in the car and bystanders.

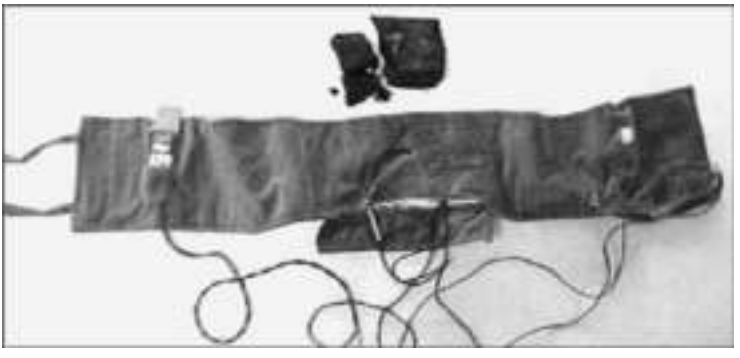


Fig. 14.15

Human Bomb belt filled with explosive and detonating device

14.6.2.8 Human Bombs

The human bombs are humans. They carry hidden IEDs (bombs) on their person. The IED contains adequate quantities of high explosives and an initiating device. It is often in the form of a belt tied around the waist of a specially made vest. They are worn under normal clothing. When the bomb explodes, it kills the person and others present at the site.

Human bomb persons are mentally deficient. They have been indoctrinated/hypnotized /tricked/purchased or fanatics motivated to act as a human bomb. When the human bomb reaches the target, the handlers, usually, trigger the initiating device through a remote control.

> *Ex-prime minister Rajiv Gandhi, and later Punjab Chief Minister S. Beant Singh, were assassinated by human bombs. The woman who assassinated Rajiv Gandhi herself initiated the bomb. In the latter case, perhaps the bomb was initiated through a remote control. (CH)*

The Taliban, in Pakistan, have refined the abuse of human bombs extensively to increase their lethality. The human bombs person drives the explosive-laden motor vehicles (motor cycles, cars and trucks) into buildings, installations and crowds, causing huge losses of life and property.

14.7 FIREWORKS (PYROTECHNICS)

Fireworks or pyrotechnics are also known as crackers. They are substances, which produce, through self-sustained chemical changes, heat, light, sound, smoke, often a combination of them, on initiation.

The fireworks are made at licensed premises only. The factories are located outside the main centres of activity in a city. They are manufactured from a host of materials, specified and approved by the authorities.

The main explosive ingredient of crackers is black powder. Barium nitrate is also used in some firework compositions. The use of chlorates in fireworks is prohibited as they are dangerous. However, many manufacturers use chlorates illegally in some of their productions.

The initiation device in crackers, ordinarily, consists of a paper tube containing mainly black powder, as in a safety fuse. The paper tube is partly exposed and partly embedded in the crackers' explosive material inside. The outer portion is lighted, the black powder in the tubes carries the fire inside the cracker and explodes the charge therein. Other initiation devices include impact initiation (as in throw-downs) or friction initiation.

There is a large variety of crackers. They differ from other explosive devices in many ways. One important difference is that some crackers (fireworks) in addition to noise, give spark and lights. In some, beautiful multi-coloured display of lights is achieved mainly through the use of aluminium, magnesium and barium metals or their salts.

Cracker manufacturers sometimes ignore regulations and make crackers, which have a larger size, and consequently, are more dangerous.

14.8 NON-EXPLOSIVE EXPLOSIONS

Non-explosive explosions are those where the usual known explosives do not form the explosive charge. Instead, ordinary substances, under certain conditions, explode and cause havoc. They may be:

14.8.1 Mechanical Explosion

Compressed gases, air or vapours, on sudden release (break loose), causes an explosion. Bursting of gas cylinders or boilers are examples of such explosions.

14.8.2 Thermal explosion

Volatile liquids on coming in contact with surfaces at very high temperature, undergo sudden (flash) conversion of the liquid to vapours cause explosion.

14.8.3 Aerosol Explosions

Aerosol is a mixture of natural gas, fuel gas others other inflammable gases/vapours of volatile liquids (petroleum products, alcohol, ethers) with air. When the concentrations of gas/vapours cross the critical limits in a confined place, such as a room, the mixture becomes an explosive mixture. A spark, flame or heat explodes the mixture to cause explosion. Such explosions are called aerosol explosion. Leakage of household gas (LPG) often causes such explosions.

Strictly speaking, these explosions are cases of rapid burning. However, due to the burning, simultaneously, of large volume of gases-oxygen mixture in confined spaces causes explosion. The explosions are powerful enough to blow out the walls, break the doors and windows, bend steel bars and even crack and move the concrete roof slabs.

Some interesting observations about these aerosol explosions are noteworthy:

1. Aerosol explosions do not start fire(s). Rather they extinguish the fire(s)[7]
2. The explosive force of these aerosols reaches maximum when the concentration of the gas in air reaches the theoretical value for its complete combustion.
3. If the amount of inflammable gases is less than the minimum critical concentration, there will be no explosion.
4. If the mixture contains a greater amount of the inflammable vapours/gas than the ideal concentration ratio, the burning is slower. It is sustained for a longer time, however.
5. The slow burning aerosol may start secondary fires.
6. If, the concentrations of combustible vapours/gas go beyond the maximum critical limits, there is no explosion.
7. Organic dust like flour, maize husk, sawdust, coal or charcoal dust sometimes dispersed in air in confined places form explosive mixtures. They explode on receiving a spark or flame.

   In a pharmaceutical factory in a town of Madhya Pradesh, the formulations of medicinal tablets contained starch as the major constituent by weight. Inappropriate humidity control dispersed the starch in the atmosphere of the hall where the tablets were being manufactured. An uneducated labourer struck a matchstick to light a bidi. There was a big explosion, which shattered the doors and windows of the hall and killed the labourer, the only person in the hall at that time. (CH)

The critical lower and upper limits are different for different materials. The limits of some of the common explosive mixtures are given in the table 8.

7. Because the available oxygen which support the combustion.

Table 14.8

Non-Explosive Explosion Mixtures

S. No.	Material	State	Ignition Temp°C	Complete burning %)	MIN. (%) Concentration	Max (%) Concentration
1	Acetylene	Gas	305	2.5	2.15	80
2	Ethyl Alcohol	Liquid	392	3.3	3.3	19
3	Ammonia	Gas	—	—	16	25
4	Benzene	Liquid	580	1.4	1.4	8.0
5	Butane	Gas	—	—	1.9	8.5
6	Carbon monoxide	Gas	609	12.5	12.0	75
7	Coal Gas	Gas	—	5.3	4.5	40
8	Ethane	Gas	472	3.3	3.0	16
9	Diethyl Ether	Liquid	165	3.3	—	—
10	Ethylene	Gas	—	—	2.7	34
11	Petrol	Liquid	280	1.3	1.3	7.6
12	Hydrogen	Gas	574	4.2	4.0	75
13	Kerosene	Liquid	255	1.2	1.0	8.0
14	LPG	Gas	—	—	2.0	10
15	Methane	Gas	632	5.3	5.0	16
16	Natural gas	Gas	—	4.8	2.2	9.6
17	Naptha	Liquid	232-277	10	—	—
18	Octane	Liquid	230	.84	—	—
19	Propane	Liquid	—	—	2.	9.6
20	Turpentine	Liquid	240	.80	—	—

A few years ago, a can containing rectified spirit was being sealed with sealing wax after use. All of a sudden the can exploded spreading the rectified spirit all around and starting a fire. It caused serious burns to the operator. The alcohol- air mixture in the empty space of the can formed an explosive mixture and caused the explosion. (CH)

14.9 ACCIDENTAL EXPLOSION

Accidental explosions are quite common because common explosives are usually unstable compounds. They are highly susceptible to various impulses. An accidentally received impulse can cause explosion.

Accidental explosions take place in the manufacture, transport, storage or in the handling of explosives, even with the best of care and precautions. Such explosions have destroyed tons of ammunition incurring huge loss of life and property.

On 16 August 2001 a devastating explosion took place in a detonators factory. The explosion took place in the crimping unit of the factory.

The explosion razed the building to the ground, killing 25 persons and injuring others. Hundreds of persons and six fire tenders were employed to bring the fire under control. Their work was hampered by the huge piles of debris and the fear of more explosions from possible live explosives in the debris.

The manufacture of detonators involves highly sensitive explosives like lead styphanate, lead azide and PETN. The former two are highly sensitive and explode even on rubbing or falling. (CH)

Accidental explosions, sometimes serious, occur mainly due to mishandling of the explosives due to ignorance and negligence. Accidents occur under various circumstances:

1. Children, mishandle crackers while playing with them on celebrations, like Diwali.
2. Something goes wrong in the manufacture, transport, storage and handling of the crackers, military explosives and explosive devices and explosions take place.
3. Accidental non-explosive explosions, due to leakage of fuel gas (LPG or CNG) cylinders, but sometimes leakage is with criminal intent and cause a serious explosion. The exact nature of the explosion has to be established to disprove or confirm the alleged nature of the explosion.

   In a case of embezzlement of a substantial amount of money in an office, the fraudsters decided to destroy the record that was likely to incriminate them. They sprinkled about five litres of petrol on the files one evening after the office hours to burn the files. They kept the files near a window from which one small glass pane had been removed. One of them returned to the scene at night after about six hours, lit a matchstick and threw it in through the window opening. There was a flash and an explosion. It damaged the doors, windows and walls.

   The police and the author visited the explosion site immediately after the incident. They found the files still dripping with petrol. They, however, did not burn, as the culprits intended. Only the edges of the files at the top were singed.

   The evaporation of petrol had filled the room with its vapours, forming an explosive mixture with air. The application of a flame caused this mixture to explode. The explosion consumed the oxygen in the room and extinguished the fire, failing to incinerate the incriminating documents, as desired by the perpetrators!

   The explosion had another unexpected consequence. The blast pushed out hot gas through the opening in the window due to the missing glass pan. They singe'd the face of the culprit who had applied the flame. He ran away from the scene unnoticed, but not before the hot gases scorched his face, leaving an undeniable stamp of his presence at the scene. (CH)
4. Stored explosives may undergo auto-oxidation or decomposition. The process generates heat and explodes the explosive.

Extensive destruction and unpredictability of possible additional explosions make investigation highly arduous, time consuming and dangerous.

14.10 HANDLING LIVE EXPLOSIVES

The tasks of locating, handling and defusing live explosives/explosive devices is an important function of the law enforcement agencies, all over the world. The explosives/explosive may be hidden anywhere: on the person of the terrorist, in his luggage, on his vehicle or he may have placed, carried and distributed the explosives in innocuous looking containers. Further, the terrorists smuggle, transport, hide and distribute the explosives and explosive devices covertly. Finally, they choose time and places of their choice to explode them to inflict maximum loss of life and property to create widespread panic and fear. The favourite sites are the public places, installations of the security forces, buses, trains and even aeroplane.

Law enforcement agencies have to prevent explosions. They can do so only if they preempt the bomber. Intensive intelligence and eternal vigilance are watchwords! Science can help them in a big way to locate/identify/handle the explosive/explosive devices. They must exploit the technologies to keep ahead of the criminal.

14.10.1 Detection/Location

The terrorist, necessarily, conceals and camouflage explosives/explosive to make them look like an innocuous object, when he is transporting them or storing them at a place of his choice. They are discovered by searching the suspected place/object manually. This is a time consuming process, and embarrassing in certain situations.

The manual search is used only when there is some evidence that the package has the offending material. Other modes have come up which are based upon the following presumptions:

1. The explosive devices have specific shapes and structures.
2. The texture of an explosive is different from the texture of other materials.
3. Explosives continuously emit micro-clusters of explosive molecules or their fragments, which are dispersed in the air and remain in the air.
4. Some of the micro-clusters of the explosive molecules (or their fragments) are adsorbed on the surfaces which are close to or come in contact with the explosives.
5. Some of the explosives are volatile and, therefore, their vapours are present in the surrounding air.

The various detection modes of the hidden explosives in bulk, are based upon the above basic concepts. Prominent methods are:

14.10.1.1 X-ray Device

X-ray machines have been in use for a long time to detect a hidden object. They are particularly handy at airports to detect firearms in baggage. They revealed bombs. Improvised explosive devices can also be recognized if they have a clock mechanism for initiating the IED; or metallic missiles to kill persons. They are, however, ineffective to identify explosives *per se*. Comparatively recent developments in technologies have come to the lacuna.

The working of these machines is simple. X-rays are passed through the baggage. The transmission creates images on the screen. The operator identifies the explosives/explosive devices.

X-ray systems are used routinely to check the baggage of the passengers. The systems are convenient and are employed in trains, buses and other targets of the terrorists, to prevent bomb explosions.

14.10.1.2 Modified X-ray Machine

In the new machine both hard and soft X-rays are used. Hard rays (higher energy rays) pass through materials of a higher atomic number, whereas soft X-rays (low energy rays) would not pass through such material; they will only pass through the material of a low atomic number.

The machine was useful, but it did not solve the problem of identification of explosives. It was further modifications and coupling it with a computer to process the data the identification/ automation was achieved. The machine is being used widely to check the baggage, especially at airports.

Continuous improvements of the device continue.

14.10.1.3 CT Scan

One is familiar with the CT (Computed Tomography) Scan used in medical diagnostics. It reveals, plane-wise, the internal make-up of an object in sections (thin slices). The same

principle is utilised to scan baggage, closed packets and parcels to detect explosives and explosive devices. Instruments have come up which are used routinely for the purpose. The instrument can distinguish between explosive and other artefacts.

The instrument is somewhat slower than the dual energy system equipment. Maintenance is also costly.

14.10.1.4 Thermal Neutron Activation (TNA)

Thermal neutron activation analysis appears to be an attractive technique as it determines the concentration of nitrogen atoms in a particular package. This concentration is about 15 to 35 % in various explosives. Non-explosive substances seldom contain that high nitrogen percentage. Hence a lot of research work is being done to utilise TNA for the bulk detection of explosives at airports and elsewhere.

The technique depends upon the fact that when thermal neutrons meet a nitrogen atom the latter picks up a neutron and becomes radioactive, emitting Gamma rays.

$$^{14}N + n_{th} \longrightarrow {}^{15}N^* \longrightarrow \text{radiations}$$

The strength of the emitted radiation is a function of the concentration of the nitrogen atoms activated (and present). Thus they will indicate whether the package (or baggage) contain explosive or not.

14.10.1.5 Detection of Explosive Traces

Explosives leave their traces at all places where they are kept. The prominent sites for their presence are:

1. The manufacturing/assembling/dismantling sites
2. The hiding/storage/disposal sites
3. The explosion site
4. The hands/body/clothes/of the handler(manufacturer, carrier/user (who exploded the explosives/explosive device) and the handled explosives in any way.
5. The vehicle in which the explosives/explosive device was carried or the containers in which they were stored.
6. The victim who was killed/injured in the explosion

Explosive vapours or of their disintegrated products diffuse in the air and float around the site. They provide micro-clusters of explosive molecules or their fragments. They are also deposited on the surrounding objects. They are heavier than air. They do not go very far from the main source. The presence of these micro-clusters of explosive molecules or their fragments permits the identification of the site as well as the nature of the explosives. Recent developments in technology have made it possible to fix their locations and identities.

In addition, the presence of these micro-clusters indicates the hiding site, storage containers or carrier vehicles. Most importantly, they lead the investigators to the hidden explosives/ explosive device.

In short, the detection and identification of the explosive traces is of great importance:

1. It identifies the hiding place of the explosive/explosive device.
2. It identifies the explosive.
3. Its identity may indicate the terrorist group who has placed the explosive at the site.

4. The device and/or its package may carry evidence, which may link it to the culprit.
5. The presence of the vapours in the air helps to locate illegal liquor production. Many police forces have trained sniffer dogs who locate the site and the paraphernalia of illicit production.

The detection of traces (vapours) of the live explosives or their disintegrated fragments is the most important preemptive action in the control of terrorist bombings. The investigating agencies use the following detection techniques routinely:

14.10.1.6 Detective Dogs

Dogs are a great gift to humanity. They are excellent companions, ever-alert security guards and perhaps the best detectives. This is because nature has bestowed them:

1. Extraordinary smelling powers; a rough guess is that the smelling power of a dog is about 300 times than that of human beings.
2. Excellent memory
3. Exceptional hearing power
4. Uncanny vision (visual powers)
5. Extraordinary alertness
6. Intense love/obedience to the master

Dogs have been employed in all sorts of police work for a long time. They are now rendering excellent service in the detection of explosives mines, bombs and other infernal explosive devices. They surpass all other modes in efficiency, versatility and certainty for the detection of explosives. Experimental trials have shown that:

1. A well-trained dog, if properly handled, could locate traces of explosives in about 85% cases.
2. Human beings, could locate explosives in about 35%.
3. The success-rate for instrumental detection of explosive traces was about 50%.

Apparently, the dogs are the best to locate explosives/explosive devices. However, the dogs give best results, if:

There are certain basics, to get the best result from dogs:

1. The dog is trained properly/adequately and the training. Is made a continuous process; no stopping.
2. The dog is in good health. Sick dogs make mistakes. A pregnant bitch, or in heat or rearing her liter does not function efficiently.
3. The dog tires in about two hours. It is not forced to work for longer hours.
4. During search, the dog is rested after every 20 minutes..
5. The dog is not put to work soon (for about 2 hrs.) after food intake. It is sluggish immediately after the meals.
6. It is better to employ a pair of dogs for searching a scene. It is synergic.
7. The handler of the dog is not changed. Dogs are one master dogs.
8. The handler must be intelligent, a natural dog lover and properly trained as dog handler.
9. The dog and the handler must get the training together.

The dogs vary in intelligence, prowess, obedience, ferocity, friendliness with strangers and working capacity. The German Shepherd is considered the best all-purpose police dog. Other notable breeds[8] commonly commissioned in police work are:

1. **Basset Hound** (locating bombs and narcotics)
2. **Beagle** (locating bombs, drugs)
3. **Belgian Milionis** (protection, attack dog, locating IEDs, locating evidence, locating drugs, prisoner transport, human tracking.)
4. **Bloodhounds;** (odour-specific ID, tracking, locating bombs, drugs, evidence)

Some studies about the sensitivity and reliability of the dogs in detecting explosives were carried out in the USA in recent times. They found that there were hardly any false positives. The dog could detect explosive traces when the concentrations as low as 90 ppt (Parts Per Trillion), a very high sensitivity.

14.10.1.7 Instrumental Detection

Instruments are widely used in the detection of explosive traces. Continued research over decades in instrumental detection of explosive traces has brought in a number of useful devices.

All instruments involved in handling explosive traces essentially perform the following functions:

1. Collect the vapours from the site.
2. Concentrate the collected samples.
3. Identify its explosive nature.
4. Identify the particular explosive involved.

The first function of the collection of the explosive traces is by suction. It may suck the air surrounding the suspected hiding place of the explosive, it may suck the explosive from the surface suspected to have adsorbed explosive traces.

In all situations, sucked traces are concentrated. It is done by passing on the traces to a filter or other special surface, which adsorb the traces. The explosive is analysed after de-absorbing the explosive.

The gas chromatograph is the usual analyser to identify the explosive. The instrument uses Electron Capture Detector, Chemiluminescence Detector or Ion Mobility Spectrometry (IMS), Mass spectrometry with or without gas chromatography is also used.

Explosive Vapour Detector is the instrument, which detects and analyse the explosive vapours at the site. It carries out the analyses at very high speed and gives results within seconds.

The reliability of these instruments is low. It is improving with the passage of time, thanks to research inputs.

14.10.1.8 Explosives Markers

Tagging chemical, added to the explosives or to substances from which explosives are manufactured, would locate the source of explosive and also indicate the site of the hidden explosive. However, the terrorists in India are using either smuggled explosives or indigenous explosives made from innocuous ingredients. The tagging may not of any use.

8. Wikipedia has given a long list of breeds used in police work (Internet).

14.10.1.9 Handling Live Explosives/Explosive devices/IEDs

There may be Live explosives/explosive devices/IEDs at the explosion site; left over accidentally or intentionally. Or, they may be at other nearby sites where they are yet to explode. The team searches the site on priority to locate/remove them so that they do not explode and cause loss of lives and limbs or property, while the scene is being processed. They examine the scene intensively and may employ sniffer dogs/instruments to detect the explosives/infernal device(s).

The location, collection and handling of live explosives and explosive devices need knowledge and experience. The novice should not handle live explosives/explosive devices. The services of the explosive expert are utilised almost invariably

The main problem in the location and collection of a live explosive or explosive device is the danger it entails. It can be a time bomb and explode at the set time, which can be the time when it is being collected. Further, the ignorance about its functioning and destructive potential can be disastrous. This is doubly true in cases of IEDs. Slight misjudgment about the infernal device may incur loss of life and property.

The live bomb is a dangerous species. It has to be handled only by professionally trained members of a bomb disposal squad. These squads were not common in India previously. However, due to the increased activities of the terrorists, most police forces have organised their own live-bomb disposal squads, both in their departmental laboratories and in their training institutes. Others utilize the services of the military bomb disposal squads for the purpose. The explosive expert should form part of the SIT whenever possible.

The SIT takes the following steps to handle the live bomb:

1. It evacuates the premises at the earliest, if not already done.
2. It surrounds the device by sandbags to make the surroundings safe, in case the device explodes.
3. It requisitions the bomb disposal squad at the earliest, if it does not form part of the SIT.
4. It considers the device dangerous, until proved otherwise.
5. It handles the device only if it and knows how to handle it.
6. It does not fiddle with an unknown device.
7. It lets the explosive disposal squad handle the explosive/bomb/IED encountered.
8. It documents the discovery and recovery through photography/videography/sketches/textual description.
9. It cordons off the explosion affected area. It does not allow any person to enter the area.
10. It does not allow any lighted match, fire or smoking on the premises.
11 It photographs the device at the site along with other evidence thereon (labels, knots, special structural features and presence of fuse or other initiation device, if any) if it is safe and feasible.
12. It guards the premises till the device is removed from the scene and other evidence collected.
13. It hands over the work of handling the live explosive/device to bomb disposal squad on its arrival. They:
    - Pick up the device with a remote controlled device, transport it in a live bomb carrier to a safe place and deactivate it.

- Freeze the device with liquid nitrogen or carbon dioxide (or other material) and remove it.
- Disrupt it at the site with shotgun, gas gun or water cannon; if it is safe to do so.
- Submerge the device in water if they are sure that water would not explode it.
- Let it age (only in an open space) away from the public routine. They guard it during the period.

14.10.1.10 Disposal of Explosives/IEDs

The nature of the device (and explosive), its location, size and the calculated hazard involved determine the mode of disposal. The bomb disposal squad has the equipment to handle the explosives/devices:

1. Protective suit for the operator including protective helmet
2. Blast container
3. Bomb suppression blanket(s)
4. Explosive detectors, including sniffer dog
5. Contactless stethoscope
6. Metals detectors
7. Probes for probing hidden bombs
8. Extension mirrors, to check areas not directly visible
9. Endoscope
10. Fiberscope
11. Thermal cutter
12. Bomb Disrupters
13. Door opening kit for rooms, cars, safes

In fact, the cities and places prone to frequent bomb attacks should have a police squad with the above equipment to meet the menace with the minimum response time and reduce the danger of the device; so that they have not to wait for the military bomb disposal squad. The police squad members must have proper training before they are put on the job.

Once the scene is safe, the investigating officer locates and collects other evidence from the scene:

1. Evidence on the device:
   - Any labels or identifying marks
   - Fingerprints, writings
   - Extraneous matter such as hair, fibres, dust, paint and tool marks
   - Any spilt-over explosive or related material
2. Footprints, footwear marks and tyre marks, if any, at or near the scene
3. Sketch(es) of the location of the device at the scene

Once the live bomb or its scare has been tackled, the SIT starts the examination of the scene systematically.

14.11 INVESTIGATIONS

The Supreme Court in one of its judgment has said that for the successful prosecution of any crime the investigation and prosecution must provide convincing evidence on the following facets of the occurrence:

1. A crime has been committed (*corpus delicti*).
2. The accused had the means, motive and the opportunity to commit the crime.
3. The accused committed the crime.

The investigation and prosecution agencies strive for the same.

The examination of the scene of an explosion provides important evidence on all of the above aspects. It is a daunting task because of its vast area, extensive damage and destruction, huge amount of debris (often pulverised) and extensive destruction of the explosive device and near-complete annihilation of the explosive used in most of the explosions. The examination requires adequate work force, time and patience.

The objectives of the examination are to find out:

1. The nature of the explosive and the explosive device
2. The quantity of the explosive used
3. The source of the explosive and the explosive device
4. The mode of initiation
5. The motive of the explosion
6. The evidence clues to link the criminal with the explosion, the victim, the scene, with the explosive, the modus operandi and the paraphernalia used

The main sources of evidentiary clues in explosions are:

1. The scene of the explosion, including the injured/dead
2. The person of the culprit including his wearing apparel, shoes
3. The mobile(s) of the culprit/associates
4. The vehicle used in the crime
5. The workshop/residence where the explosive devices were assembled/made
6. The office of the culprit's: documentary evidence
7. The computer of the culprit, if he uses one
8. The culprits' associates or helpers
9. Criminal record of the culprit, if any

14.11.1 The Scene of Explosion

The scene of explosion is the most important source of evidence. It has the crater, the shattering wave route and the destruction. It has remnants of the explosive/explosive device They indicate the power and possible nature of the explosive used, and of the explosive device itself. It is the main source of explosive/explosive related evidentiary clues:

1. Traces of the explosive(s) used. They are flash impacted on the objects around.
2. The shattered pieces of the container, scattered at the scene.
3. Missiles of the IEDs/bombs or their fragments
4. Remnants of the initiating device (detonator)
5. Remnants of the timing mechanism, clock mechanism and the like

6. Fragments of electrical and electronic systems used, including circuit board
7. Insulating and adhesive tape pieces

In addition, there may be traditional clues like fingerprints, footprints, discarded containers, bags, tools, tool marks, blood due to accidental injury, fibres, hair, cigarette stubs, match stick, and the like, which may have survived the explosion. They provide the linkage of the explosion with the perpetrator.

The scene of explosion is dangerous. It may have live explosives, which may explode any time, there may be live electrical wires which may electrocute a person, there may be unsafe building structures which may fall and injure a person. The safety of the team has the first priority. The leader of the must ensure the same. Therefore, the scene handling is properly planned to locate, collect, preserve and document the evidence thereon.:

14.11.2 First police officer at the Scene

The duties of the first police officer at the scene of explosion are:

14.11.2.1 Saves life and reduces trauma

The first police officer at the scene attends to the injured, provides medical help and sends him/them to hospital at the earliest.

14.11.2.2 Protects the scene

He expels all unauthorised persons from the scene, prevents entry of new onlookers, passerby or curiosity hunters, including media people to the site. He protects the evidence at the scene from the criminals or their well-wishers, curiosity hunters, media people, animals/beast and from weather (rain, wind!)

14.11.2.3 Demarcates/barricades the scene

The first police officer demarcates/barricades the scene. Usually the periphery of the apparent scene is increased by about 20% to avoid missing evidence, which may have flown to a longer distance. Encircling the scene with rope or string is adequate.

The pressure wave of the explosion sometimes travels to long distances and carries shattered pieces of the device along with it. He identifies the pressure wave route and protects it.

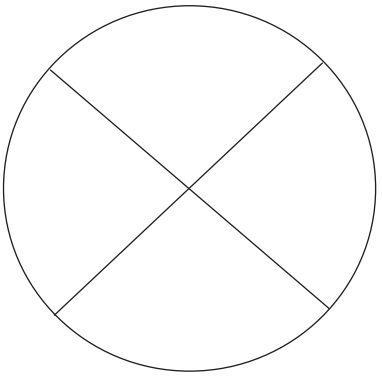


Fig. 14.16

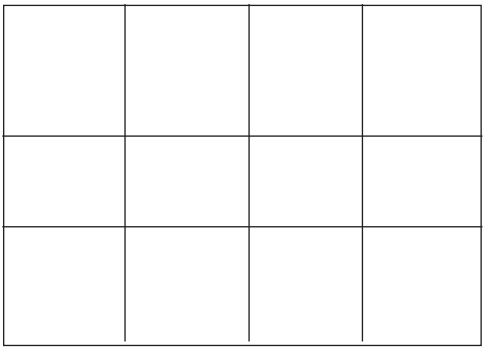


Fig. 14.17

Zonal Divisions

14.11.2.4 Assesses the scene

The first police officer assesses the special needs of the proper handling of the scene of explosion, as it is usually quite abnormal. He conveys the needs of the investigation to the concerned persons without loss of time.

14.11.2.5 Observes the audience at the scene

He observes the behaviour of the persons present there and guess the identity of the possible culprit.

14.11.2.6 Informs the SIT

He remains at the scene till the SIT comes and takes over the charge of the scene. He informs the team what he has observed, and what his general assessment of the occurrence is.

14.11.3 Special Investigation Team (SIT)

The scene of explosion needs a special investigation team. The team includes:

1) A police officer as team leader;
2) An explosive expert, to defuse any explosive device which might still be live at the scene and to study the pattern and extent of the destruction to indicate the nature of the explosive which caused the explosion.
3) A forensic expert to process all evidentiary clues;
4) a sniffer dog team to locate the live explosives, and
5) An imaging expert for videography/photography

   Sometimes, other experts in the field of electronics, electricity and architecture are needed. The first police officer may assess/give the requirements of such specialist(s) whenever needed. Or, the SIT MSR requisition the services of these specialists; if and when needed.

   A panel of members of the special investigation team is prefixed. The team is available on call at all hours.

Experts' help is indispensable in the examination of the scene of an explosion. The expert should have both practical and scientific knowledge relating to explosives being used/misused in the country.

Different explosives behave in different ways and create different types of explosion waves and patterns, depending upon their nature, quantity, mode of confinement and placement. The expert studies the destruction pattern, which indicates the nature and quantities of the explosives used. He reconstructs the explosive device and pattern of events. Further, he helps to locate the evidentiary clues which may link the culprit with the crime.

14.11.4 Equipment Needed at the Scene

The scene of explosion needs the usual equipment for documentation/collection/packing/sealing of evidentiary clues and handling of the scene. In addition, it may need special equipment, which includes the following:

1. A live explosive device may need a bomb carrier.
2. Implements like rakes/shovels/spades to remove and sift the debris.
3. Large amounts of debris at the site may need an earthmover/cranes/truck carriers.

4. Expansive scenes may need a helicopter for complete coverage of the scene photographically.
5. Flood lights/powerful hand-torches to examine the scene
6. Skilled/semi-skilled workforce to help process the debris.

14.12 EXPLOSION SCENE HANDLING

The Special Investigating Team in handling the explosion scene take up the work systematically.

14.12.1 Safety Considerations

There may be live explosives/explosive devices/IEDs at the explosion site; left over accidentally or intentionally. Or, they may be at other nearby sites where they are yet to explode. The team searches the site, on priority, to locate/remove/identify/and process the explosive/explosive device so that they do not explode and cause loss of lives and limbs or property, when the scene is being processed. They employ sniffer dogs/instruments to detect the explosives/infernal device(s). The employ explosive expert in case they discover live explosive/explosive device.

Once the live bomb or its scare has been tackled, the SIT starts the examination of the explosion scene systematically.

14.12.2 The Seat of the Explosion(s)

The team fixes the seat of explosion. It is indicated by the pit(s) or crater(s) formed at the site. The crater is photographed along with a scale. It is also sketched and video-filmed. Its dimensions including depth and direction of the flight of explosive are properly evaluated and measured/recorded.

The seat of explosion carries numerous clues:

1. The crater carries traces of the explosives, which are flash impacted/deposited around the crater and on nearby objects. They are located, photographed (whenever possible), collected, packed and sealed. They are useful to build up the IED and connect the criminal with the crime.
2. The crater may have shattered pieces of the device. They are located, their identity and their location fixed (videography, photography, sketch, textual description) and, ultimately, collected, packed and sealed. There may be scores of pieces of the debris at the site. They may be carrying traces of the explosive used. The pieces of the devices are sent to the laboratory to identify the explosive. Quantities of explosives on the debris are often small (usually in pictograms), but modern analytical equipment can handle such small quantities.

14.12.3 The Explosive Wave Pattern

The explosive wave pattern is characteristic of the /explosive/explosion. The pattern depends upon the nature/the quantity of the explosive, the explosion mode, the construction of the explosive device and the topography of the site. The examination helps to identify the explosive and the device used. The main characteristics of the wave are:

1. The wave is directional
2. It takes the path of least resistance.
3. It moves, pushes, shatters and bends the objects in its path depending upon its strength and the resistance of the obstructing object.

4. It may scorch materials, which come in come in contact with the flame or hot gases.
5. The plotting of the shattered pieces can lead to the center of explosion.

In a case of murder, dynamite sticks and a blasting cap were used to kill the victim. The explosive was placed underneath the mattress on the floor of a makeshift shed at a quarrying site. The blasting cap was placed in the sticks and the lead wires connected to a battery. The switch was turned on at night when the victim was asleep. There was an explosion. The body was shattered to small unrecognisable pieces except for the limbs and head. The explosive wave had travelled straight upward and created a hole in the roof of the shed. The surprising part of the murder was that the head and neck of the victim were in one piece and they carried no other injury. Likewise, another person sleeping about one metre away on the same floor did not suffer any injury. (CH)

The shattering pattern of the pressure wave is distinct**.** Its intensity and direction provides a lot of information. The evidentiary clues, which may be parts of the infernal device or of the targeted object (victim) fly along with the pressure wave, and are found scattered on the path taken by the pressure wave. The main misleading feature of the pressure wave is the negative pressure wave; this is caused by the sudden creation of vacuum by the original pressure wave. The negative pressure wave (not very common) may throw or tilt the object in the direction *opposite* to that taken by the actual pressure wave. It often needs knowledge/experience/care/time to delineate correctly the path of the wave. The starting point of the pressure wave(s) indicates the seat of the explosion.

The shattered pieces of the infernal device(s), including those of container, initiators, clockwork (in time bombs) and missiles scatter far and wide They are also found embedded in the nearby objects: in the body of the victims, in the debris or along the wave path.

If the infernal device has used missiles, they or their pieces are found on or in the victims. If the body is in smithereens they are found embedded in the flesh pieces. They are carefully located/collected/documented/packed/sealed.

The collected pieces are pieced together in the laboratory to determine the nature of the original object or device to which these pieces belong. It is seldom that all the pieces are available, but often the pieces available can give a correct idea about the nature of the original device.

The plotting of the positions of the pieces of the device on a graph paper and extending the lines towards the centre can indicate the seat of the explosion correctly.

LPG gas leakage from an LPG cylinder caused an aerosol explosion in a hotel. The kitchen staff had left the site at about 11 pm. They had partially closed the coal oven but the cinders continued to glow. The leaking LPG and air formed an explosive mixture concentration in about 3 hours. As soon as the gas concentration reached the explosive limit, it exploded. The red hot coal in the oven provided the needed heat/flame to explode the gas mixture.

The kitchen was on the third floor, but the gases, being heavier, travelled down to the ground, first and second floors as well. The explosion blew out the doors and windows on all these floors and the shutters on the ground floor bulged out. The maximum damage was on the third floor.

There was little fire. Only a chair and some clothes in the kitchen were singed (not burnt). (CH)

14.12.4 Evidentiary Clues at the Scene

Extensive destruction, fragmentation, contamination and the vast area where the clues are scattered at the scene of an explosion, make the search for evidentiary clues an arduous and time-consuming task. An investigator loses track of the evidentiary clues because he loses patience in the ordeal. The following points are noteworthy:

1. The area for search at the scene of the explosion is fixed before starting the search. A larger area (~20 % more) than the apparent crime scene area is marked out as the area for search. It should exclude the possibility of missing any clue at the scene.
2. The crime scene area is large, it is divided into zones and the search is carried out zone-wise. Thus, more than one team can search the scene. Even if only one team has to examine the scene, zone formation ensures a thorough examination.
3. Usually the search starts from the focal point - the crater in most of the cases. The spiral search method is used if the scene is not too large.
4. If the centre of explosion (crater) is not clear, the search starts from the outer extreme periphery, and closes at the centre; again if the scene is not too expansive.
5. In the case of a strong directional pressure wave, the path of the wave is also searched to locate the evidence. The search starts from the initiating point of the wave to the end of the wave path. The crater is examined with particular attention.
6. The size, shape, depth of the crater are also important. The devastation caused and the patterns of damage are important clues to indicate the power and nature of the infernal device. Its surface, all around, is likely to retain fragments of the infernal device from initiators, detonators, explosives, containers, missiles as already mentioned
7. The pressure wave (its size, extent and damage it causes) indicates the nature and the amount of the explosive used.
8. The traditional clues like tool marks, fingerprints, abandoned objects, foot or footwear marks, tyre marks are also sometimes available. They are searched/collected.
9. The criminal may abandon objects at the scene. They are important clues. They are searched and collected.

Theoretically, there should be a wealth of clue materials at the explosions site. However, the destruction is extensive and debris is in large quantities, whereas the residual evidence is in minute quantities. It is intermixed and hidden in or covered by heaps of debris. The search and location of evidence, therefore, needs patience, experience and time as well as manual and instrumental help.

14.12.4.1 Collection of Clues

Collection of clues from the explosion site follows the usual pattern[9]. Some of the main principles are reiterated, with advantage:

1. A video film of the scene is prepared before collection of the clues.
2. The location of the clues is documented through photography, sketches and textual record.
3. The investigator marks the clue for identification before packing.
4. Clean containers are sued to contain the collected. They are sealed at the site of recovery.
5. The recovery memo is signed by the IO, the recovery witnesses.
6. The identity/authenticity/integrity of the clues must remain above board.
7. The chain of possession must remain intact.

9. See Chapter 5 of this book.

14.12.4.2 Dispatch of Clues

For the dispatch of the evidentiary clues the following points are noteworthy:

1. Clues are sent through a special messenger from the site itself, whenever possible.
2. All person other than the investigator and the expert handle clues in the sealed packet only.
3. A log of the movements of the evidentiary clues is kept to maintain the chain of custody intact.
4. Items collected from different sites are packed separately.

All the clues collected must be logged properly in the case diary and also in the dispatch letter sent to the expert. The process of location, collection, packing, sealing and dispatch must ensure that the relevancy, authenticity, integrity and continuity of the chain of possession remain legally acceptable.

14.12.5 Evidence on the Culprit

The culprit may have evidence on his person/clothes/residence/work site. The evidence may be:

1. Particles of explosives or other materials may be present; if he has manufactured/assembled the IED. In fact, micro traces of the explosives persist on the hands, fingernails and clothes of the culprit for a long time if he has handled the explosive himself. This is especially true of RDX and other military explosives. The wearing apparel and swabs with alcohol from the hands and nails are collected.
2. Stains from the explosives or their constituents are found on the person or clothes of the culprit.
3. Dust or debris from the scene of the explosion may be found in the hair, on the clothes or in the welt of the shoes.
4. In some cases, there may be injuries on his person from the exploded material.

   In a case already mentioned elsewhere in this book, a person working in an office poured petrol on some 'offensive' files at the time of closing the office. The culprit returned some hours later at night and threw a burning match stick on to the documents through a broken window pane. There was an explosion in the process, as the petrol vapours and air had formed an explosive aerosol in the meanwhile. Hot gases coming out of the broken window singed his face, imprinting his involvement in the deed. (CH)
5. There may be embedded fragments of the explosive device on the person or on clothes of the culprit.
6. The culprit (or suspect) is the source of sample fingerprints, foot or footwear prints and body materials like hair, fibres for comparison with the corresponding extraneous material found at the scene.

14.12.6 Evidence in/on Vehicle

If the culprit has used a vehicle to carry the infernal device, the vehicle may carry the following evidence:

1. Dust, dirt, and debris from the scene.
2. Standard sample, for tyre marks found at the scene.
3. The traces of explosive from the infernal device.
4. Particles/stains/odours of the explosive or explosive device.

5. Bloodstain from the culprit/victim/accomplices if they were injured.
6. Hairs and fibres from the culprit victim.
7. Fingerprints of the culprit/victim.

14.12.7 Evidence at Residence/Work Site

The premises used for assembling or preparing the infernal device are a rich source of evidence:

1. The residual materials, chemicals and gadgets used for the construction of the device.
2. The tools used for the assembly.
3. The additional IEDs/Bombs/Explosive, if the culprit is a professional terrorist/saboteur.
4. Spare containers/initiators/timers/explosive materials/and missiles corresponding to the materials used in the IED at the explosion site.
5. Evidence relating to processing/storage/manufacture and assembling.
6. Notebooks/diaries/laptop/computer/mobile, containing incriminating evidence relating to the explosives/devices/explosions; or, names, telephone numbers and/or addresses of the gang members/clients/material suppliers or other criminal elements.
7. Incriminating literature: on explosives/explosive devices or on terrorism.

If the culprit is living with family, he usually keeps such activities secret from the family. He uses a site, which the members of the family do not frequent. Abandoned sheds or garages are the usual sites.

The site of the IEDs' manufacture is often dangerous. It may have dangerous chemicals, incomplete (or complete) IEDs which may go off. There may even be a booby trap set up to destroy the premises if someone fiddle with them (workshop/laboratory). The forensic expert, a member of the team examine the site, taking all precautions.

14.13 DISPOSAL OF IEDs

The disposal of a live bomb needs all the care, not only from the safety angle but also for the preservation of the incriminating evidence to link the culprit with the crime. The following steps help to preserve the evidence:

1. Allow the device to age at the site, if it is safe to do so.
2. Photograph the explosive device at the site covering labels/knots/special structural features/presence of fuse cord or other initiation device and the writings/symbols/signs thereon.

14.13.1 Disposal Mode

The modes for the disposal of IEDs/bombs are:

1. **Explode the device** at the site where it is found, if it is safe to do so and the process does not damage the surroundings; after collecting the evidence thereon.

   The exploding the IED have two main disadvantages:

   - It destroys most of the incriminating evidence relating to the device.
   - Destruction of the IED at site is impracticable in most of the cases because the explosive devices is placed mostly in buildings/vehicles/crowded places. It incurs heavy losses and inconveniences the public.

Fig. 14.18

An IED destroyed by exploding it in a secluded place

2. **Quench the explosive device.** the device is put in a bucket of water and allowed to soak thoroughly. Water enters into the explosive device and renders it ineffective. The quenching mode was quite effective in the old days because the usual explosive material used to be black powder, which would become ineffective in water. The explosive materials have changed since. Water has no effect on some new explosives.

   Light oil is also used as the soaking medium. It has one advantage over water. The device, which may explode on contact with water (for example, by completing an electrical circuit), will be safe in the oil.

   The 'quenching' process spoils or destroys the evidence like fingerprints, writings on the body of the device. Such evidence is photographed whenever possible, before quenching.

3. **Dismantle the explosive device.** The evidence is preserved this way. It is done by opening of the device. The opening must be certified as safe. In any case, the explosive expert alone decides and takes action accordingly. He has the necessary knowledge/experience/equipment to do so.

4. **IED/Bomb is taken to a safe place and destroyed.** It involves the following steps:

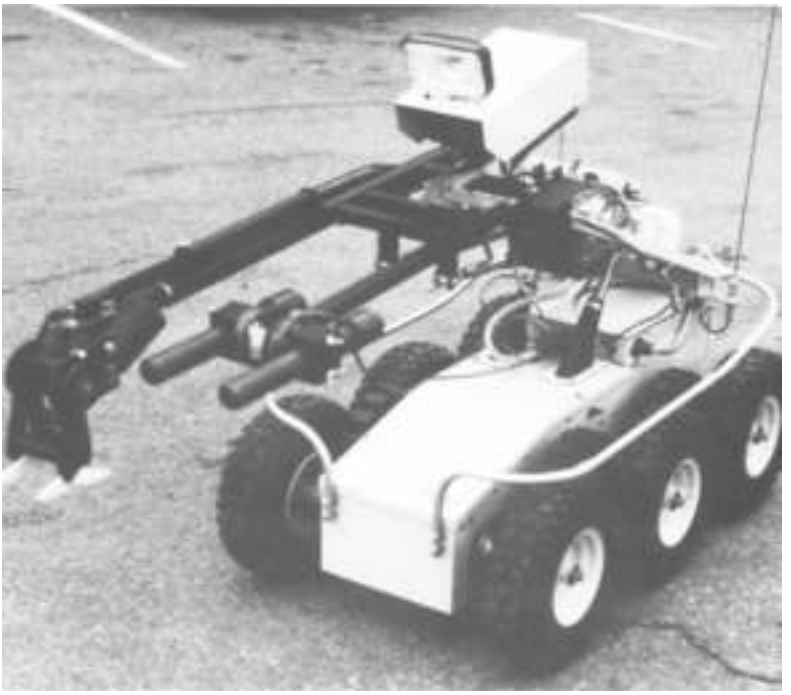


Fig. 14.19

Remote control explosive handling device

1) A remote control robot picks up the infernal device from the site.
2) It places the device in a shock-proof, specially made carriage. It has a 10 cm thick steel tube. The tube open at both ends. There is a steel wire cage hung inside the tube in the centre. The infernal device is placed inside the cage. The tube is fixed behind the carriage. If the infernal device explodes during transport, the pressure waves will go upwards or downwards. The spaces at the sides remain unaffected. Thus, practically no damage is caused even if the device explodes en route.
3) The device is taken to a safe place away from the inhabited areas.
4) It is allowed to 'age' for three days.
5) It is turned by a remote-controlled device; left for a few hours and then overturned; then again left for a few hours more. If it does not explode on turnings, it can be approached and examined.
6) The infernal device is opened from an unexpected place/way. For example, if the device is tied with a rope or string, it is cut. If there is a soldered joint, it is dissolved in mercury. It is not hammered or sawed.
7) Metal parts are removed by the action of sulphuric acid (10%).

The device is not dragged/tilted/turned or overturned/sawed at the discovery site. Minimum force is used in all operations involved in handling the device.

The circumstances of each case - location, size of the device and calculated hazard involved - determine the disposal mode.

All items, explosive charge, initiators, container, wrapper, string, wire, paper, wiring, fibre, cloth, tape, clockwork, switches, caps and adventitious materials such as hair, dust, dirt, paint and tools are evidence. They are located/collected/preserved and sealed.

If the explosive device is considered dangerous it is destroyed at the earliest with the help of a bomb disposal expert.

> *Perhaps it was a case of revenge. A person received a parcel by post. He tried to open it. It exploded and killed this man.*
>
> *Police came to the scene and discovered a wire which was recently cut. The police recovered a wire cutter. The departmental laboratory connected the cutter with the cut on the wire. It linked the suspect with the bomb. The lower courts accepted the linkage. The apex court rejected the evidence. (CH)*

14.13.2 Dispatch

The inspectors of explosives, located at different places, were the authorised persons to handle the evidence until some decades ago. Now the explosive experts of Forensic Science Laboratories carry out the examination of live explosives/explosive devices and their explosion products. The experts normally visit the scene of explosions and assist the investigator to locate, collect and pack the correct clues.

The items sent to the laboratories are primarily the products of explosion from the explosive device and those items that are not likely to explode in transit.

The expert examines the live explosives/explosive devices at the scene itself. Only those items that the expert wants to examine in the laboratory are collected/packed/sealed and sent to the laboratory. The expert guides the investigator to pack the correct amount correctly; to avoid an accidental explosion in transit.

Other evidential clues: products of explosions and extraneous objects, marks are sent to the laboratory as usual.

The following reminders are useful while dispatching explosion related exhibits to the laboratory:

1. A special messenger takes the exhibits (especially live explosives/explosive devices) to the laboratory.
2. The instrumental detection/identification requires only a very small amount of explosive. Therefore only a small amount crime explosive (a few grams only) is sent to the laboratory.
3. Initiating device (detonators: one or two only) are sent for examination. The explosive and the detonators are packed in separate packets.
4. The Station Master of the railway station is informed that a special messenger is carrying/transporting explosives in the train.
5. Dangerous explosives or explosive devices are defused when sent to the laboratory. The expert usually examines the live devices at the scene.
6. Fulminates, azides, styphnates and self-igniting incendiary solid or liquid mixtures (chlorates mixtures, phosphorus solution, bombs) are dangerous explosives. They are handled/transported with extra care.

14.14 PROBLEMS

An explosive expert can assist the investigation and trials of cases involving explosives and explosive devices in a big way. He answers most of the questions, including the following:

1. **Is the given material an explosive?**

   The expert has sophisticated instrument which can identify/quantify the explosive in all practical collection of the clues.

   The identified explosive may link the case with similar other cases involving similar explosive.

2. **Is the given contrivance an explosive device?**

   The expert examines the various components of the device. If he finds explosive/ detonator in the device, he identify the device as IED.

   He can link the device to similarly structured IEDs used in other cases. Thus, he interlinks the cases.

   The linkage may indicate common perpetrator/maker/seller.

3. **What was the modus operandi?**

   The expert can indicate the *modus operandi* from the physical clues relating to explosion and other evidentiary clues found at the scene or with the victim.

   He can also give the sources of the explosive/explosive devices used.

4. **Is the explosive device involved in the case an IED or a military bomb?**

   This is comparatively easy question to answer. The standard military bombs carry information written on them. Besides, they have proper construction/finish. The IEDs do not have proper structure/finish.

5. **How was the infernal device initiated?**

   An expert can identify the initiating device in the IEDs, most of the time, from the fragments of the initiator. Fragments of batteries, clock- work, detonator often provide ample evidence to identify the initiator.

6. **Was a similar explosive or explosive device used in any other cases(s)?**

   The expert can link the cases where similar explosive or explosive devices had been used.

7. **Can the culprit or the manufacturer be linked to the IED or the explosion?**

   The expert can link the person who has handled the explosive in any way. This is possible through comparison of traces of explosive which are transferred to the person who handles the explosive. The explosive traces can now be analysed even in Pico-grams.

8. **Could non-explosive substances like LPG-air mixtures cause the explosion?**

   Fuel gases, volatile organic liquids or even finely dispersed combustible organic powders, in the form of an aerosol, make an explosive mixture. When such an aerosol is exposed to a flame, it explodes. Sometimes even a spark from a static discharge is sufficient to cause the explosion.

9. **Is the explosion accidental or intentional?**

   The accidental and intentional explosions are not always easy to distinguish. In some cases, there may be evidence available to determine the same; in others the evidence may not be there.

   Total evidence (eyewitness accounts, scientific evidence and circumstantial evidence) can often discriminate between the two.

10. **What was the level of expertise used in the manufacture of the IED?**

    This question can be answered in most of the cases.

11. **Is there any evidence to link the given IED with the premises used for the manufacture?**

    Ordinarily, there is plenty of evidence to link an IED with the premises where it was manufactured/assembled. However, it may not always be available. Traces of explosives, residual material and the tools used may connect the manufacturing site with the device.

    In a mid-night blast, a double storey building of a local police station was razed to the ground. Huge amount of debris was searched and primary fragments formed due to the blast shown in the photograph could be located. Typical fragments indicated conclusively to form a steel Tiffin box, which helped the police to nab the culprits responsible for the blast. Explosive substance RDX, causing the blast was also detected. (CH)

Fig. 14.20

Fragments of Tiffin bomb (RDX)

12. **Was the given vehicle used to carry the IEDs?**

    If the vehicle can be examined soon after its use to carry the explosive device, it is possible to link the vehicle with the explosive as there may be traces of the explosive in the vehicle. Delay may cause loss of the traces. Besides, the construction of the device also affects the amount and nature of evidentiary clues available in the vehicle.

13. **Was the explosion accidental, due to negligence? Or, was it due to the illegal or defective manufacture of the cracker?**

    It is difficult to answer this question with certainty in most of the cases. The question can only be answered in probabilities either way.

14.15 EVALUATION

The evidentiary clues, in explosion cases, are found at the scene, with the culprit, at his residence, on his vehicle or en route. Their proper evaluation helps the investigation and trials of the cases to find:

1. The nature of the incidence
2. The type of the explosive/explosive device used
3. Linkage/de-linkage of the perpetrator with the evidentiary clues/scene of explosion/ the victim/the vehicle used in the crime /modus operandi and other similarity with other cases of the explosion.

4. The source(s)/the manufacturer/the seller of the explosive/infernal device which the culprit used.
5. The helpers/accomplices and the gang members/the terrorist group that helped him to cause the explosion .

In view of the above, the investigator does his best to locate/collect/pack/seal the evidentiary clues with all the formalities to maintain their relevancy, integrity, authenticity and continuity. He dispatches the exhibits to the expert analyst at the earliest. He provides him leads for a correct and early solution of the case.

14.15.1 The main evidentiary Clues

The main evidentiary clues at the explosion site are:

1. **Vapours of explosives;** they are available in all sites of blasts which have taken place in a closed space, in the crater of the blast, and adsorbed on the surfaces surrounding the blast sites, including debris. The vapours from the air are collected by passing the air over some adsorbent (charcoal or some synthetic substitute).

   The adsorbed vapours are detected with the help of the electronic detectors. They are desorbed on heating. They can also be extracted with a solvent.
2. **Unexploded explosive;** it is available in traces in most of the cases, being usually flash impacted on the surfaces and objects close to the explosion site. They persist for a long time if not washed away by rain or carried away by the wind. Adsorption on the surfaces retains them for a long time. The explosive traces in the form of clusters of microcrystals and decomposition products may also be found in the air of the enclosed areas like a room or vehicle even after long intervals.
3. **Explosive residues;** residue formation is certain. The particles of residues are scattered all around the scene. They may help to find the nature/amount of the explosive.
4. **Fragments; t**he explosion shatters the container/timing device/initiators,/ detonators,/batteries and electronic devices used for initiation through remote control. The fragments are scattered all around at the scene. They help to visualise the infernal device.
5. **Burn marks;** detonating cord leaves burn mark at the surface where it was placed.

   The mark indicates that the detonation cord was used to initiate the explosion. It also indicates the position of the explosive device *vis-à-vis* the position of the perpetrator.
6. **Electric blasting cap;** when an electric blasting cap is used as the initiator, it leaves its insulating material and fragments of the cap at the scene. They are useful clues to reconstruct the infernal device and the explosion.
7. **Missiles;** missiles like nails, ball bearings, nuts, bolts, used in IEDs. They are frequently recovered from the scene or from the body of the victim(s) and objects at the scene. They prove useful to link the criminal with the crime as similar material is often found with the person who has assembled the device.
8. **Electrical insulating tape**; electrical insulating tape and hook up wires are sometimes used to delay explosion of an IED. They survive the explosion in some cases and help to link the criminal with the crime.

The expert in the laboratory can piece together the materials recovered and come up with a reconstructed entity, which often permits identification of the original IED.

14.15.2 Evidence in Debris

Explosions create heaps of debris and leave traces of the explosives and other materials used in the IED in the debris. The residue traces are intermingled with heaps of dirt, dust and rubble. It is a daunting task to locate and identify them. However, enlarged investigative teams and equipment have made the task easier. Often electronic detectors are used to detect explosive residues impacted on the debris. Mechanical devices are used to sift the debris.

The sifted suspect material is thoroughly examined, visually and microscopically. A stereomicroscope with an extended arm is useful.

14.15.2.1 Separation or Extraction

The separation/extraction of the explosive residues or their decomposed products from the debris and locating the shattered pieces of the IED is a time consuming process and needs patience. Some sources of the debris are comparatively richer in explosive residues. They provide more convenient materials to work with. They are:

1. The **crater;** the crater surface and the soil to some depth are the most important locations for residual traces of the explosives and the explosive devices. The debris from the crater surface and underneath the soil is thoroughly explored. Fragments of the device/initiators/detonators/boosters/containers/missiles are driven into the soil. They are found embedded in the surface. In addition, traces of the explosive are always found in the crater debris.
2. The **surface and objects surrounding the seat of explosion;** these places and objects carry adsorbed traces of explosives. They are explored.
3. The **pressure wave route; a**rticles displaced or disturbed in the path are likely to carry traces of the explosive residues and fragments of the device.
4. The **blasted items (animate or inanimate);** they are important sources of evidentiary clues. They are similar to those items found in the crater debris.

In a railway compartment, dynamite sticks were used as an IED placed on luggage shelf, which was made of flat metallic bars with empty spaces in between. When the site was examined after the explosion, a part of the dynamite was found still sticking to the metallic bars. Perhaps the metallic bar prevented the transmission of the shock wave to the unexploded dynamite. (CH)

14.16 IDENTIFICATION OF THE EXPLOSIVES

14.16.1 Preliminary Tests

In testing live explosives, only small amount of the material is used to eliminate the danger of an accident. The investigator can perform these tests himself. The tests are:

14.16.1.1 Friction Test

Some explosives are sensitive to friction. They explode when rubbed against rough surfaces.

A trace of the suspected material is placed on a stone slab. The material is scratched with a metre-long bamboo stick. The experiment is repeated with increasing amounts of the material. If the material catches fire, it is an explosive.

14.16.1.2 Impact Test

Some explosives are impact sensitive. They are tested with a hammer blow.

A small quantity (starting from a trace and increasing the amount gradually to a pinch) is taken on a piece of paper, kept on a standard anvil and struck with a hammer. An explosion indicates that the material is an explosive. The experiment is repeated about half a dozen times to ensure that case it does not explode.

14.16.1.3 Flame Test

A small amount of the material under test is taken on the tip of a strip of paper. If the material is liquid, the paper is dipped in the liquid to absorb a fraction of a drop of the liquid and dried. The paper tip is then exposed to a candle flame. If the burning takes place violently, it is possibly an explosive. The colour of the flame may indicate the nature of explosive.

Fig. 14.21

Flame test indicate explosive

14.16.2 Laboratory Tests

Identification of the explosives, from the explosion scene debris involves the following steps:

1. **Stereomicroscopic examination**; the debris is examined under a stereomicroscope and suspected explosion materials, especially the fragmented pieces of the non-explosive components of the device, are picked out manually for a detailed examination.
2. **Solvent extraction**; after the stereo-microscopic sorting, the debris is extracted with solvents (acetone, chloroform). The solvent extracts the organic constituents of the explosive/explosion residues. The extracts are concentrated and tested for the constituents.
3. **Hot water extraction**; inorganic constituents are extracted with hot water. The extracts are concentrated and tested for the constituents.
4. **Gas Chromatographic identification**; it identifies the explosive. The explosive vapours are collected/concentrated and analysed by gas chromatography.

Other techniques used identification procedures are similar for most of the explosives. They are:

- For organic Constituents[10]: TLC, IP, IR, XRD, GC-MS, HPLC and HPLC-MS
- For inorganic constituents: IP, IR, XRD, SEM with EDX

14.17 PRESENT SCENARIO

Explosives, explosive devices and explosions were a rare phenomenon about three decades ago. Neither the public nor the law keepers had to bother much. Terrorism has changed the scenario. There have been so many explosions in the past few decades that nobody feels safe from the extreme danger they pose. The law keepers have to be vigilant and ready to meet the terrorists' challenges of new sophistications and the more powerful explosives that they are increasingly employing. The investigators have to join hands with the intelligence agencies on the one hand and the explosives and forensic experts on the other hand. In addition, they must use modern technology. Besides, the combined efforts, on international level, will provide the necessary synergy to meet the menace effectively.

The government need take the following steps to meet the challenges of the terrorist squarely:

14.17.1 Creation of Explosive Division in FSLs

The investigation of the explosion is both time and expertise intensive. The expert presence at the scene is indispensable. He needs long hours in the laboratories and the courts need him at the trials where often weeks are spent to exhaust the exhaustive cross-examination. And the need has arisen only in the past decades The volume of work, the high expertise needed and proof the court need creation of full-fledged explosive divisions. This should be done without further delay. Their work is already well-defined.

1. Analysis of pyrotechnic mixtures, low and high explosive substances and their preparations/formulations
2. Analysis of improvised explosive mixtures
3. Identification of plain/electric detonators and their fragments
4. Ascertain electric and non-electric initiation (triggering) mechanisms
5. Identification of IEDs, their different parts in exploded/unexploded forms
6. Evaluation of LPG explosions
7. Characterisation of live, exploded or diffused hand grenades
8. Identification of delay mechanism from the original or from their fragments.
9. Reconstruction of the sequence of occurrence of the blasts from the available information.
10. Plan and adopt a methodology for the investigation, collection and evaluation of the evidence material.
11. Identification of explosive substance or ascertaining original formulations used in improvised explosive devices from the samples collected from the blast sites.
12. Preparation of technical opinions relevant to the investigation and for legal purpose.
13. Creation of a data bank of IEDs, components of IEDs and profiles of different blasts.
14. To conduct research and develop methods to provide solutions to tackle the bombing related crimes.

10. Sharma, BR. 2011. Firearms in Criminal Investigation and Trials, Chapter 2. Universal Publishers, Delhi.

15. Validation of test methods (SOPs).
16. Calibration of the instruments.
17. Maintenance of the integrity of reference standards
18. Interconnect different bomb blasts from their profiles.
19. Revisit old blast sites to collect more clues appropriate to the investigation.
20. Evaluation of old samples of different blasts retained by other investigating agencies.
21. Connect the perpetrators of different bombings from the clue materials such as initiation mechanism, explosive formulations, the containers housing the device and other mechanisms controlling the device for its blast to occur in an intended way.

14.17.2 Induction of Modern Equipment

New equipment like SEM, RDX apparatus, Ion exchange chromatography, GC-MS, LC-MS, IR Spectrophotometery and mass spectrometery need induction in Explosive Division of forensic science laboratories to study, estimation and analyse:

1. The fragments and structural changes to identify primary and secondary fragments
2. The particles recovered from the craters or blast points to identify detonators or initiation devices.
3. The residues from the blast sites for detection and estimation of cations and anions for identification of inorganic substances.
4. The unexploded explosive substances for their identification
5. The organic explosive substances in unexploded preparations by Liquid Chromatograph.

14.17.3 Creation of Low Temperature Storage Facility

Many explosive substances like TATP, Nitroglycerin and explosion products are volatile in nature. Samples collected from the explosion/blast sites need to be stored at low temperature to avoid loss of volatile substances especially like NG and TATP. Low temperature facility should comprise circulation of chilled air inside the store without any electrical switches or any electrical appliance.

14.18 ADDITIONAL READINGS

1. Beveridge, A. *Forensic Investigation of Explosions.* Taylor & Francis, USA.
2. Yallop, HJ. *Explosion Investigation.* Forensic Science Society, U.K.

14.19 CASE LAW

14.19.1 Offence[11]

The contention of the learned counsel for the petitioners is that the offence, even if it is true, falls under section 6(3) of the Indian Explosives Act 4 of 1884, that it is a bailable offence and that, therefore, the petitioners are entitled to bail. Indian Explosives Act 4 of 1884 was enacted to regulate the manufacture, possession, sale, transport and importation of

11. *Masha Angami v Manipur Administration*, 1968 Cr LJ : 187 (Manipur).

explosives. Section 4(1)(a) of the said Act defines "explosive" as gunpowder, nitro-glycerin, dynamite, gun cotton, blasting powder, fulminate of mercury or of other metal and every other substance, whether similar to those above mentioned or not, used or manufactured with a view to produce a practical effect, explosion, or a pyrotechnic effect Section 6(3) of the said Act lays down that any person who manufactures, possesses or imports an explosive in contravention of a notification issued under section 6 shall be punishable with imprisonment for a term which may extend to 3 years or with a fine which may extend to Rs 5,000 or with both.

But, the Explosive Substances Act 6 of 1908 was enacted to amend the law relating to explosive substances. Section 2 of the Act defines "Explosive substance" as deeming to include any material for making any explosive substance Section 5 of the said Act runs as follows:

> *Punishment for making or possessing explosives under suspicious circumstances.- Any person who makes or knowingly has in his possession or under his control any explosive substance, under such circumstances as to give rise to a reasonable suspicion that he is not making it or does not have it in his possession or under his control for a lawful object, shall, unless he can show that he made it or had it in his possession or under his control for a lawful object, be punishable with transportation for a term which may extend to fourteen years, to which fine may be added, or with imprisonment for a term which may extend to five years, to which fine may be added.*

Gunpowder is also an explosive substance within the meaning of section 2 of the Explosive Substances Act (Act 6 of 1908). The case of the prosecution is that, when the driver of the vehicle questioned the first petitioner about a bag carried by the first petitioner in the vehicle, the first petitioner told him that it contained rice. So, the first petitioner appears to have made a false representation about the material, if the case of the prosecution is true. Also the court has to take judicial notice of the fact that Kohima in Nagaland is a disturbed area. So it cannot be said at this stage that the first petitioner was in possession of 32-one-second kg. of gunpowder with him for any lawful purpose. There is *prima facie* reasonable suspicion that the first petitioner had gunpowder with him for an unlawful object. As such, the punishment for the offence may extend to 14 years imprisonment under section 5 of the Explosive Substances Act 6 of 1908, and it is a non-bailable offence.

14.19.2 Non-dangerous Explosions[12]

So far as the charge under section 3 of the Explosive Substances Act is concerned it has to be established that the accused concerned had caused "an explosion of a nature likely to endanger life or to cause serious injury to property....." In the present case although the evidence clearly indicates that there were explosions resulting from the throwing of bombs there was no sufficient evidence that the explosions were of a nature likely to endanger life or to cause serious injury to property. All that the evidence shows is that some minor injuries were caused to some of the constables of the police party by splinters thrown out by the exploded bombs. The evidence being that the bombs were thrown at the party and in their midst, the fact that only minor injuries were caused by the explosions would indicate that the bombs were not of such a nature as to cause explosions likely to endanger life. There is also no evidence that any injury not to speak of serious injury was caused by the explosions to property. The explosions that were caused might very well have been caused by bombs and not by crackers, but that fact alone would not satisfy the requirements of section 3 of the Act. The position appearing from the evidence is the want of proof that the explosions actually caused by them were of a nature likely to endanger life or to cause serious injury to property and such being the case the conviction of the concerned appellants under section 3 of the Act although based on the expert's evidence that a bomb of the type examined

12. *Nema Adak v State of West Bengal*, 1965 (1) Cr LJ 160 (Cal).

by him would be capable of endangering life on explosion is not justified, particularly in view of his positive evidence in cross-examination which shows that although a chemical examination of the remnants of a country made bomb indicated existence of potash chlorate and arsenic sulphide therein, it is on the quantity and proportion of the said ingredients about which there is no evidence, that the mischief-making power of a bomb depends. We find that in face of the positive evidence as to the nature of the explosions caused by the bombs in this case, the conviction of the concerned appellants under section 3 of the Explosive Substances Act and the sentence passed thereunder cannot be sustained and must be set aside.

14.19.3 Identification[13]

It appears that soon after the explosion, the Inspector of Explosives, West Circle, Bombay, proceeded to Latur for investigation. He took into possession certain substances from the scene of the accident. By means of a letter dated May 11, 1962 sent from the office of the inspector of explosives these substances were forwarded to the chemical examiner, Government of Maharashtra, for examination. The samples were as follows:

A white substance in a packet suspected to be potassium chlorate.

An orange yellow substance suspected to be arsenic sulphide.

A round stone piece containing smears with orange yellow chemical adhering to it. (This was to be examined for the presence of arsenic sulphide and potassium chlorate.)

A contraption to test the explosibility of a mixture of potassium chlorate and sulphur.

Dinesh Chandra, P.W. 10, assistant inspector of explosives also went to the scene of the explosion along with the Inspector on May 9, 1962 and various samples were collected from the shops of the appellants as well. All these were forwarded to the chemical examiner for examination. The report of the chemical examiner (Ex-87) which is to be found on the original record gives the following analysis in respect of the above substances:

"Exhibit (1) is potassium chlorate. Exhibit (2) is arsenic sulphide. Exhibit (3) has sediment containing arsenic sulphide and sulphide and sulphur adhering to it. Exhibit (4) has potassium chlorate and sulphur in its cavity. Apart from the original record these facts stand established from the evidence of Dindesh Chandra, P.W. 10 and the report (Ex. 38) which he had submitted on November 2, 1962 which was duly proved by him when he appeared as a witness. He has further stated that when he inspected the premises of the factory on May 9, 1962 he noticed half burnt raw material like sulphur, white powder, the ingredients of which he could not ascertain. There were grinding stones as also empty tubes for manufacturing exhibition fireworks. As regards the cause of the explosion, his opinion may be given in his own words:

> *Probable cause of the explosion must have been the large quantities of the raw materials, gunpowder and finished fireworks and the raw materials for the same were stored in the premises.*

At the time of the explosion there were large quantities of the fireworks, finished as well as in the process of preparation, loose compositions and the gunpowder. They were being dried in the open court yard of the premises. Some of the items contained very sensitive explosive compositions which might have exploded due to the spark, percussion or friction or fire.

Although there was no direct evidence of the immediate cause of the explosion but indisputably the explosives the possession of which was prohibited under the notifications issued under the Act were found in the shops or the premises where the appellants carried on their business and the substances that have been mentioned which were of a highly hazardous and dangerous nature were apparently being used in the manufacture of the fireworks since

13. *Bhalchandra v State of Maharashtra*, 1968 Cr LJ 1501 (SC).

they were found at the scene of the explosion, (*vide* the evidence mentioned before and the finding of the trial court and the additional sessions judge.) As stated by Dinesh Chandra, P.W. 10 these explosives had sensitive compositions and even friction or percussion could cause an explosion. It is further proved that in the factory itself where the explosion took place the persons who were employed were mostly women who brought their small children with them and young children below the age of 18 had been employed in the manufacture of the fireworks. The factory was situated in close proximity to residential quarters. It becomes therefore all the more incumbent on the appellants to have completely avoided the use of highly sensitive compositions of the nature mentioned above.

CHAPTER 15

FIRES

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Fig. 15.1
A case of arson. Evidence.

15.1 GENERAL

Fires cause extensive destruction of property and life, incurring colossal losses. The incidences of arson were few and far in-between in India previously. The occurrence of the incidents is increasing now. The extent of arson (malicious fires) can be visualised from the number of **registered cases of arson in Assam** in three years for which figures were available.

Table 15.1

year	2010	2011	2012
No of cases	437	506	700

As per NCRB (National Crime Record Bureau) arson Incident data for 2014 to 2016 are as follows:

2014	2015	2016
9289	9710	11196

The losses reported for the year 2016, in USA, are:

Table 15.2

1	Reported fire incidents	1,342,000
2	Fire deaths (civilian) [One civilian death occurred every 2 hours and 35 minutes]	3,390
3	Injured persons [One civilian injured occurred every 34 minutes]	14650
4	Property loss	$10.6 billion

The law, therefore, takes a serious view on arson (malicious fires). Sections 435 and 436 of the Indian Penal Code contain the penal provisions:

[s 435.] **Mischief by fire or explosive substance with intent to cause damage to amount of one hundred or (in case of agricultural produce) ten rupees.—**

Whoever commits mischief by fire or any explosive substance intending to cause, or knowing it to be likely that he will thereby cause, damage to any property to the amount of one hundred rupees or upwards [1]*[or (where the property is agricultural produce) ten rupees or upwards], shall be punished with imprisonment of either description for a term which may extend to seven years, and shall also be liable to fine.*

[s 436.] **Mischief by fire or explosive substance with intent to destroy house, etc.—**

Whoever commits mischief by fire or any explosive substance, intending to cause, or knowing it to be likely that he will thereby cause, the destruction of any building which is ordinarily used as a place of worship or as a human dwelling or as a place for the custody of property, shall be punished with [2]*[imprisonment for life], or with imprisonment of either description for a term which may extend to ten years, and shall also be liable to fine.*

Bride burning or dowry deaths have added a new dimension to fire investigations in India. Husbands/in- laws of the newly married woman kill those brides who have not brought an adequate dowry with them. Burning them before or after killing is a severe and unfortunate crime. This mode of killing is popular as the killers proclaim that the bride caught fire accidentally or she committed suicide. The crime is viewed, as it should be, very seriously. The law has been modified to facilitate investigations and pin the crime to the perpetrator. A new sub-section 113 B has been added to section 113 of the Indian Evidence Act.

[3]***[s 304B. Dowry death.—***

(1) Where the death of a woman is caused by any burns or bodily injury or occurs otherwise than under normal circumstances within seven years of her marriage and it is shown that soon before her death she was subjected to cruelty or harassment by her husband or any relative of her husband for, or in connection with, any demand for dowry,

1. Ins. by Act 8 of 1882, sec. 10.
2. Subs. by Act 26 of 1955, sec. 117 and Sch., for "transportation for life" (w.e.f. 1-1-1956).
3. Ins. by Act 43 of 1986, sec. 10 (w.e.f. 19-11-1986).

such death shall be called "dowry death", and such husband or relative shall be deemed to have caused her death.

Explanation.—For the purpose of this sub-section, "dowry" shall have the same meaning as in section 2 of the Dowry Prohibition Act, 1961 (28 of 1961). (2) Whoever commits dowry death shall be punished with imprisonment for a term which shall not be less than seven years but which may extend to imprisonment for life.]

[4]***[s 113 B. Presumption as* to dowry death.—**

When the question is whether a person has committed the dowry death of a woman and it is shown that soon before her death such woman has been subjected by such person to cruelty or harassment for, or in connection with, any demand for dowry, the Court shall presume that such person had caused the dowry death.

Explanation.—For the purposes of this section, "dowry death" shall have the same meaning as in section 304B of the Indian Penal Code (45 of 1860).]

Bride burning is inhuman. It is a slur on the society. Hundreds of brides are burnt every year in India. It has increased from about 400 a year in the early 1980s, to around 5800 a year by mid-1990s.

According to NCRB, there were 1948 convictions and 3876 acquittals in dowry death cases in 2008. Is investigative negligence/non-accountability/ corruption responsible for this sorry state of police investigations?

The investigation of fire has assumed tremendous importance for other reasons also:

1. The fire has great potential for destruction of property and life. It is perhaps a more potent weapon than a firearm to settle score directly or indirectly.
2. It destroys most of the evidence by burning it.
3. The efforts to put down the fire often destroy or contaminate the evidence.
4. Arson fires are involved in serious crimes:
   - Communal or political riots
   - Murders
   - Personal vendetta
   - Insurance frauds
5. Fire is used to destroy evidence of illegal activities:
   - Manufacture and storage of explosives, narcotics, illicit liquors, counterfeit currency, arms, and ammunition
   - Clandestine press
   - Evidence relating to espionage; spies often burn records at a pinch
   - Evidence relating to smuggling

4. Ins. by Act 43 of 1986, sec. 12 (w.e.f. 19-11-1986).

The investigation of the cause of a fire, due to its destructive nature and huge piles of debris is a difficult, tedious, and daunting task. The possibilities to establish whether the fire is accidental or malicious are meagre. The chances of pinning the guilt on to a suspect are still less. The main reason for the failures is that the investigations require long hours, in fact, days and weeks, and the patience of the proverbial donkey, which are not available with most of the IOs these days.

Main motives for arson are communal and political vendetta, personal enmity, and destruction of incriminating evidence relating to crimes like embezzlement, theft, robbery, and murder.

Maniacs also cause fires.

Further, the crime is being committed for economic gains (insurance claims!). The vast economic potentialities of the crime are coming home to the criminal mind. The crime is likely to be exploited on an ever-increasing scale in the coming years.

15.1.1 Profile of an Arsonist

The cases of arson are common in the USA. The psychologists in the USA have evolved a profile of an arsonist. It may be of some interest in India also in view of the increasing incidences of arson. The elements of the profile are:

1. **Age:** 16-30 years usually
2. **Mental status:** About 25% of the arsonists are unbalanced, mentally/emotionally
3. **Social status:** Most of them are from slums. A few of them are from the middle and upper class, usually unemployed
4. **Marital status:** Usually unmarried, divorced, and maladjusted
5. **Personality:** Feeble, cowards, with an inferiority complex, introverts, frustrated, lonely, anxious, tense, obstinate, contemptuous of authority and society, lack ambition and self-respect
6. **Associates:** Usually criminals and drunkards
7. **Motive:** Excitement, revenge, sadistic pleasure, to attract attention or show-off
8. **Target:** Random
9. **Time:** Night
10. **Recidivism:** Common

Professional arsonist is a different species. He is known in the USA as TORCH. They are professionals. They have different profiles. Likewise, maniacs do not correspond to the profile. They are also called pyromaniacs.

15.2 NATURE

Fire is combustion (burning, rapid oxidation) of substances. It is a chemical reaction (process). It is accompanied by light and heat. The process is possible only if certain requirements are met with, which are:

1. Appropriate ignition temperature
2. Proper initiator

3. Combustible material — fuel
4. Oxygen

If any of these requirements are not available, burning does not take place. Commonly, oxygen is supplied by air, the ignition device (e.g., flame) provides ignition temperature and any combustible material, usually organic matter, burns on being heated in the ignition process. The combustion/burning proceeds if the supply of oxygen and combustible substance is sufficient. If the supply of oxygen is limited, smouldering takes place, there are no flames, in the process. It may be noted that most of the substances burn in the gaseous state only.

Sometimes, there are no signs of combustion, but it may be going on inside a substance on a limited scale. Such substance may cause a fire on getting an opportunity to spread. For example, a charcoal piece may appear 'cold' and 'dead' from outside but inside it, the fire may continue. The oxygen absorbed by the charcoal piece supports the combustion. The coal piece may start a fire in such cases.

15.2.1 Progress

The progress of fire depends upon a number of factors. In addition to the availability of combustible material and oxygen The important ones are:

1. Temperature of fire
2. Humidity
3. Direction and velocity of the wind
4. Rate of production and dissipation of heat energy

The consideration of these factors carefully helps to discriminate between accidental and malicious fires.

> *In a case, a guard of a coal tar drum store had been selling coal tar clandestinely for some period. He was caught. The fear of the pending inquiry and consequences thereof, loomed large on his mind. One night he poured one drum on the floor of the closed storeroom and put it on fire to commit suicide and to destroy the evidence. Next day he was found dead, stuck in the coal tar. He had burns on the lower parts of the body only. The fire consumed, only partially, even the coal tar of the drum he had poured out. It appears the limited supply of the oxygen did not permit the complete destruction of the body and the store. (CH)*

15.2.2 Control

The spread of fire is controlled not only to protect property and life but also to save the incriminating and other evidence having a bearing on the cause of the fire. The methods employ the basic principles of production of fire in the reverse order:

1. Supply of oxygen is prevented by covering the fire with carbon-dioxide gas or non-combustible foam or other materials.
2. Vapourisation of the fuel is prevented by soaking it with water or by covering it with sand.
3. In the jungle and other big fires, spreading over a large area, the fire is controlled by creating a belt of "open space" from where all combustible materials are removed, segregating the burning area.

Fire may be malicious or accidental. The law presumes the origin of all fires to be accidental unless proved otherwise. The burden of proof, as usual, is on the prosecution.

15.2.3 Arson

Arson is a malicious fire. The arsonist tries to achieve:

1. Proper initiation
2. Quick spread
3. Complete destruction

The culprit uses various devices and materials for initiation:

1. A flame through a matchstick, a candle or a fuse cord is the commonest. They may or may not leave traces.
2. Explosives and incendiary materials are used as initiators. A large variety is available in this class. It may be a simple cracker or even an incendiary bomb. The choice depends upon the material available and the ingenuity of the culprit. The explosive device is, usually, kept in a container, which may or may not get destroyed in the ensuing fire.
3. Chemicals used for the purpose are, sulphuric acid with sugar and potassium chlorate, sodium and potassium metals, ethyl lead and yellow phosphorus. The materials start fire under certain conditions.
4. Heating appliances are excellent initiators. A live electric heater, electric iron, or a radiator, if kept in contact or near contact position with combustible material, such as clothes, papers, fibres, grass, leaves, or films, may cause the fire.

   In an interesting case, a heater was on during office hours. The current supply stopped. It was not restored during office hours. While closing the office, the concerned staff forgot to put off the heater. A fire was noticed by the guard at about midnight. It was put off soon after. The investigation of the fire revealed that there were some files lying near the heater. When the current was restored, the heater put the files on fire. (CH)
5. Remote control electronic devices to start malicious fires are increasing. They trigger a heating mechanism, which starts fires.

The arsonist uses accelerators in order to ensure that the intended target (say a building) catches fire quickly. He uses the following accelerators:

1. Inflammable liquids, such as petrol, kerosene oil, diesel, alcohol, turpentine oil.
2. Easily combustible solids, particularly celluloid[5] (old films), paper, rags, clothes, straw, grass, cotton and cotton waste. They are sometimes are soaked in vegetable or other inflammable oils or resins.

   Buildings do not burn easily. The arsonist, therefore, ensures sufficient supply of combustible materials like furniture, books and clothes to destroy the building.

5. New films are made of cellulose acetate. They do not burn easily.

Fig. 15.2

Limited supply of combustible material limited the loss

The common targets of the arsonist in India are cattle sheds, crops and haystacks, standing crops and jungles. Factory godowns, government buildings and factory premises are the targets of the political arsonist. Indiscipline among students may lead to arson in academic institutions. Students and mobs set buses, railway stations, and trains on fire.

15.2.4 Accidental Fires

Accidental fires are caused by:

1. Discarded burning cigarette ends or matchsticks.
2. Heating appliances, which generate sufficient heat. If combustible materials obstruct dissipation of heat, the materials catch fire.
3. Short circuiting and defective insulation.
4. LPG leakage
5. Lightning. Its occurrence is rather rare in India.
6. Sparks generated by friction in factories, or cinders thrown by locomotives or factory flues. They may fall on combustible materials and start fire.
7. Domestic pets (e.g., cats and dogs) which may upset a lighted candle or kerosene oil lamp and start fire.
8. Explosives are highly susceptible to pressure, friction, impact, heat and flame. Their defective storage is a constant source of accidental fires.
9. Sun's rays, passing through bottles or glass get concentrated as with a lens. If they fall upon combustible materials, they start fire.

CAUSES OF FIRES

- Appliances & equipment: cooking; heating; washing machines & dryers; air conditioners and fans; and more
- Arson: juvenile fire setting: children playing with fire and intentional fires
- Candles; home fires may involve candles
- Chemical and gases: Natural gas and LPG start fires spontaneous combustion. It is rare.
- Electrical and consumer electronics; short circuiting, overheating, overload
- Fireworks: They start fires in the manufacturing processes, in storage, in transport, in using
- Holiday: Christmas trees, holiday lights and decorations
- Household products: Mattresses, bedding and upholstered furniture
- Lightning Fires and Lightning Strikes
- Smoking materials: Fires involving smoking materials (i.e., tobacco products)

National Fire Protection Association of USA

15.2.5 Spontaneous Fires

Spontaneous fires occur due to internal exothermal reaction. The temperature increase rapidly and finally, spontaneous fires start. There is no external agent to cause these fires. Internal changes in the materials cause such fires. Common examples of spontaneous fires include:

1. **Auto-oxidation**; some haystacks and refuse/dung heaps catch fire if correct conditions of temperature and humidity are present. The bacteria initiate

auto-oxidation but the later stages are purely chemical. The bacteria cannot survive the temperatures developed by the process.

2. **Exposure**; drying oils give heat while 'drying' (example linseed oil). If the oil is impregnated in rags or fibres, it gives an expansive thin film of oil in compact space, sufficient heat is generated to put the fabric on fire.
3. **Chemicals**; they undergo exothermic chemical changes to produce sufficient heat to start fires.
4. **Coal**
5. **Pyrites**
6. **Pistachio nuts**

Spontaneous fires are rare.

15.2.6 Automobile Fires

Automobile fires are rather rare in India. It is almost impossible to burn a vehicle without external fuel. A vehicle contains very little combustible material. It is its tyres, wire covering, upholstery, paint and a tank of fuel. All this is just insufficient to burn the vehicle completely as shown by actual experiments. Experiments have also proved that short-circuiting in a vehicle, ordinarily, does not start a fire capable of consuming the vehicle. Under normal conditions of an accident, the tank bursts and most of the fuel in the tank scatters on the ground. It is not entirely consumed in burning the vehicle. However, the combustible load in the vehicle may start a fire.

> *A truck had been loaded with kerosene oil drums. It was going on a hill road. One of the drums was seen leaking by passers-by. The liquid spread over most of the hind part of the vehicle and started dripping. The vehicle, at one point, bumped against a bolder and probably generated a spark. The liquid was already (presumably) sufficiently heated due to the friction of the tyres. It caught fire. It consumed the whole vehicle in a matter of minutes.*
>
> *The driver had not noticed the seepage*. (CH)

Automobile fires are frequently malicious in origin. The culprit may start the fire to destroy the vehicle for any of the following reasons:

1. To collect insurance money
2. To burn incriminating evidence
3. Domestic quarrel
4. Revenge or jealousy

The main evidence to the crime is the seeped fuel found in the earth underneath, in the debris or in the upholstery if the vehicle is not fully consumed. The fuel used to burn the vehicle may be different from the one used in the vehicle.

The following points are also checked:

1. Incriminating evidence in the debris
2. Prior removal of small gadgets and accessories
3. Tampering of fuel distribution system-fuel pump, gas line and gas cap.
4. Short-circuiting is indicated by fused wires, discharged battery, blown fuses and bulbs (If lights were on).

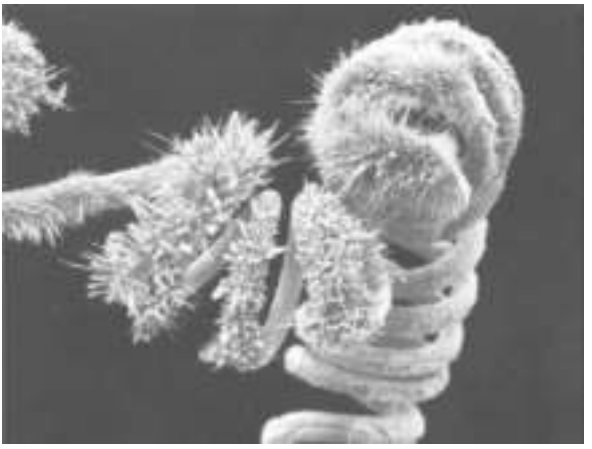

Fig. 15.3
Head lamp wire fusion on blowing-up

Ignition Sources for Vehicle Fires

1. Open flame
2. Electrical Fittings (short-circuiting, Sparking)/overloading
3. Broken bulbs
4. Mechanical sparking
5. Hot surfaces/objects
6. External spark
7. External electric heat/spark
8. Catalytic converter
9. Turbocharger

15.2.7 Burnt Bodies

Human burnt bodies are the *corpus delicti* in some crimes. The burns may be superficial, serious or fatal. Fires, explosives, corrosive chemicals (acids, alkalis) or electromagnetic rays (X-rays, ultraviolet rays) may cause them. The present discussion mainly concerns with burns from the fire directly or indirectly.

15.2.7.1 Classification

Burns are classified as first degree, second degree or third-degree burns:

1. First degree burns; in first degree burns the affected site becomes red. No tissues are destroyed. The burn does not leave any scar.

2. Second degree burns; they ulcerate the tissues. The skin is blackened and the hairs are singed. They form permanent scars.

3. Third degree burns: prolonged contact of the body with naked flame or materials at high temperatures causes third-degree burns. These burns are often fatal. In some cases, the life is saved by amputing the burnt limb. Ordinarily, when the body surface involved is more than 30%, the burns prove fatal.

The percent of the body burnt can be calculated from '**the Rule of 9'**. The rule indicates the relative approximate surface area of the various body parts:

1. Head = 9%
2. Chest (front) = 9%
3. Abdomen (front) = 9%
4. Entire back and buttocks = 18%
5. Each arm (front = 4.5%, back = 4.5%) total = 18%
6. Each leg (front = 9%, back, back 9%) total = 36%
7. Groin = 1%

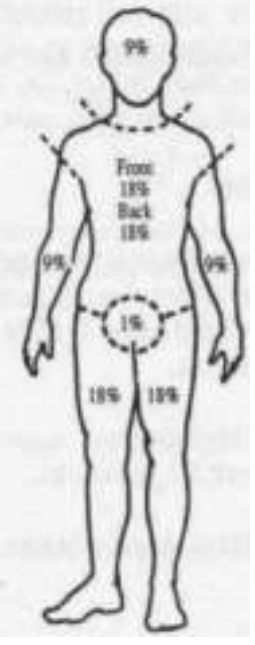

Fig. 15.4
Rule of Nine

Death of the victim, due to burns, is painful. If the victim does not die of shock, immediately, the death may take place in four to ten days. In some cases, death has taken place even after six weeks. The time of death depends upon the age and health of the person, the part of the body burnt, the depth to which the fire (or heat) has penetrated and the treatment which he received after the burning. Death may also occur indirectly due to medical complications of the body functions and formation of toxins; or, due to suffocation and inhalation of smoke and poisonous gases when the victim is engulfed by fire.

15.2.7.2 Post-Mortem or Ante-Mortem Burns

Whether the burns are ante-mortem or post-mortem, is an important question. The answer often helps to decide whether a particular death is homicidal or otherwise. Quite frequently a person is killed and set on fire.

The features, which distinguish ante-mortem burns from post-mortem burns, are:

1. Ante-mortem burns show inflammation.
2. Old burns show reparative scars, partial or complete.
3. Ante-mortem burn is surrounded by a red line (ring). If the burn occurs within a few minutes after death, it may also show the ring. Post-mortem burns show no such red rings/line, ordinarily.
4. The blisters are usually caused in ante-mortem burns. They may also appear, sometimes when dead bodies are burnt.
5. Ante-mortem burns blisters contain albumen rich serum, whereas post-mortem burns blisters contain little liquid, instead, the vesicles contain air.
6. If a person has died in a fire, which engulfed the victim, the air passage contains soot particles and the blood contains carbon monoxide (> 5%). Their absence indicates homicide. The cause of death is not suicide or accident. The absence of these clues has proved useful in establishing in bride burning cases.

Table 15.3

Signs of Ante-Mortem and Post-Mortem Burns (Nutshell)

S No	Evidence (sign)	Ante-mortem burns	Post-mortem burns
1	Redness line(s)	Present	Absent
2	Blisters	Blister with serous fluid. Base inflamed	Blisters with watery/air fluid. Burst easily. Dry base.
3	Vital reaction	Present	Absent
4	Enzymes	Increase in enzyme activity	Does not show
5	CO-Hb	Carboxyhemoglobin > 5% or more. 10% common. Blood colour change to cherry red	No cherry red colouration
6	Soot	Present	Present: passive intake in some

15.2.7.3 Accident, Suicide or Murder

It is often important to establish from a given burnt body whether the death was homicidal/accidental/suicidal. The following checkpoints help:

1. If the burns are post-mortem, death is homicidal.
2. If the victim carries injuries other than burns, it indicates struggle. Death is probably homicidal.
3. If the body contains intoxicants or sedatives, the death is probably homicidal, though an accident cannot be excluded from this observation alone. The quantity of drug/intoxicant/stupefying agent found may prove a useful guide.
4. Recovery of projectiles or the injuries on the person of the burnt body indicates homicide.
5. Examination of the scene of occurrence, its photograph, sketches and description often reveal the true nature of the occurrence.
6. A bone fracture may indicate murder
7. Cuts of sharp-edged weapon
8. If the body of the victim was burnt after death, it is most likely murder. The features, which discriminate ante-mortem and postmortem deaths (*supra*) help.

Fig. 15.5

The person was killed first then he was burnt in lonely shop to simulate accidental death due to fire

15.3 EVIDENTIARY CLUES

15.3.1 Preliminaries

In the systematic handling of clues in cases of arson/accidental/other fires, the investigating team takes the following preliminary steps to:

1. **Guard the scene of occurrence**, until the examination is complete.
2. **Survey the scene of fire**, to assess the needs to handle the scene effectively.
3. **Record of the scene**; by videography/photography/sketching and making a textual record; covering the extent of damage, the pattern of smoke deposit, the site of origin, the presence of foreign matter and damage to various installations.
4. **Take close up photographs of the evidence**, to clarify important points and to identify evidence.
5. **Observe the fire in progress**; at various intervals, if he reaches the site to observe the live scene and record its progress/control inputs.
6. **Contact the media people or other parties**, who have recorded (photographed) the fire in progress. He collects the copies of the photographs from them, in case he reaches the scene after the occurrence.
7. **Collect a copy of the site/**building plan.
8. **Make complete inventory of the stores** on the burnt premises [from the occupant(s)].
9. **Inspect** the following with the help of experts:
    1) Electrical installations
    2) Heating appliances
    3) Burnt materials
    4) Remnants of the burnt materials. The owner may help.
10. Collect information about the character of the fire.
11. Ascertain the time when the fire started and when it was extinguished.
12. Ascertain the mode of extinguishing the fire.

In arson cases, the nature of the clues vary from one case to another; depending upon the technique employed by the arsonist, the extent of damage and destruction caused by the fire and the efforts and processes used to put down or control the fire.

15.3.2 Collection

15.3.2.1 Fingerprints

Fingerprints are found on articles touched by the culprit but not destroyed by the fire. Some fingerprints remain in cases where complete destruction did not take place.

Points of entry/exit, doorknobs, door handles and windowpanes may carry fingerprints. If the culprit broke open a safe, cupboards or handled furniture, utensils and other articles, there is a likelihood of fingerprints on them. The culprit usually does not take the usual precaution to avoid leaving fingerprints in arson cases. He believes that fire will destroy them.

Left over articles by the culprits often carry fingerprints.

15.3.2.2 Track Marks

Track marks: foot, footwear, and tyre marks are found on the approach and exit routes and in or around the scene of occurrence, provided the visitors to the scene do not destroy them.

15.3.2.3 Miscellaneous Traces

If locks, windows, ventilators or skylights were broken, they may have exchanged evidentiary clues with the culprit. The culprit may carry evidence, such as glass fragments, paint, varnishes, wood fragments, dust and dirt at the sites. He leaves tool marks, tool fragments and foot and finger marks at the scene. These traces are checked/located/collected. The exchanged traces on comparison with the authentic source link the criminal with the crime, almost invariably.

15.3.2.4 Initiators

An initiator may not get destroyed in the fire. The unconsumed parts form useful clues. They are found at the point of initiation of fire.

Even if the initiator is destroyed in fire, its residues (smoke ash patterns or their chemical composition) may indicate the initiator used.

If a mechanical or an electronic device was used to initiate a fire, it may be found intact or damaged at the point of origin of the fire.

The usual types of clues relating to initiator are:

1. If a fuse cord was used as an initiator, burnt residue or burn marks are found on the surface. The residue and the mark are photographed. The residue is collected.
2. If explosive has been used as initiators, it leaves a characteristic pattern or smell/vapours at the scene. The burnt residues/vapours of the explosive may identify it. The identification of the explosive may lead to the source/culprit.

   Destruction pattern of an explosive is also characteristic. It indicates the possible explosive.
3. Remnants of the explosive devices are found sometimes. They provide linking evidence.
4. The initiation may have been done through a remote control device. The remnants of the counterpart initiator device are found at the initiation site. They are located/collected/evaluated.
5. If chemicals have been used as initiators, they may leave characteristic smell/residues, which identify the chemical used.

15.3.2.5 Accelerators

The accelerators are promoters to speed up the burning and to enlarge the target area. All types of easily inflammable materials (in solid, liquid or gaseous, state) especially of organic origin, are used as accelerants. The frequently used accelerants are, however, liquid hydrocarbons: petrol, kerosene and diesel.

Accelerators are not always destroyed in the fire. Some inflammable liquid/its vapours seep into the soil, debris, smoke deposit, ash or other absorbing material. It is possible to extract and identify them.

The accelerators are found at the point of origin of fire, near the point of initiation usually. Even if the investigating officer fails to detect any accelerant himself, he should collect some debris from the likely places for examination by an expert in a forensic science laboratory. Or, he should get the help of a laboratory expert to collect the correct sample.

Accelerators are dispersed over a large target area to ensure quick and complete destruction.

15.3.2.6 Combustible Materials (Fuel)

Insufficient attention is paid to ascertain the material responsible for the production of fire. In city arson cases involving pucca buildings are consumed, combustible material has to be inducted. Where has it come from? The answer can help a lot in solving the arson case.

Common promoting fuels are:

1. Wood, wooden furniture
2. Grass, dry leaves, fodder
3. Clothes and garments; mineral fibre textiles resist fire.
4. Paper in all forms, newspapers, magazines, books, files, all are excellent fire promoters
5. In laboratory fires, organic solvents act as accelerants.
6. Plastic and rubber materials

If the combustible material was not present at the arson site, it must have been brought from outside. The induction process and the nature of the residue may lead to the arsonist.

Burnt documents, furniture and clothes are examined to identify them. The motive of the arsonist in burning the documents may indicate the arsonist.

15.3.2.7 Electrical Installations

It is difficult for an average investigating officer to detect tampering of the electrical installations. The services of an electrical engineer, preferably of the one who had laid the wiring, is requisitioned. The opinion of the engineer, along with the evidence he has uncovered, is recorded.

15.3.2.8 Heating Appliances

Heating appliances (such as stove, furnace, electric heater, electric iron, radiator and the like) start many a fire. They are often not destroyed in the ensuing fire. They, therefore, provide vital information relating to the origin of fire.

15.3.2.9 Fire-extinguishing Devices

An arsonist usually tampers with the fire extinguishing devices if present on the premises to make them non-functional. This is done only when he has planned the act. The damaged devices indicate arson. Besides, they may lead to the arsonist through fingerprints or tool marks left on the devices while tampering them.

15.3.2.10 Foreign Matter

Tools, fragments of tools, containers for initiators/accelerators/fragments of explosive devices and personal articles of the arsonist are found at the scene of occurrence. They help to identify the culprit through the usual clues (fingerprints, residual initiators, accelerators, containers.

The articles are searched at and around the scene of fire, dustbins and waste heaps.

15.3.2.11 Evidence of Other Crime

The arsonist may have tried to destroy incriminating evidence relating to other crime(s) like murder, fraud, theft or robbery. Naturally, the IO checks the debris carefully to find/eliminate evidence of some other crime.

A fire once broke out in a factory and consumed part of the building. As there was ample fire hazard in the factory, the origin was considered accidental. However, when debris was being examined and removed a charred body of a person was recovered. The recovery led to the investigations of two crimes—arson and murder. (CH)

The premises may have been used for illegal activities, like counterfeiting currency, secret press, espionage, manufacture of illicit arms, liquor or narcotics. For fear of detection, the premises may have been burnt down. A careful search of the debris often provides evidentiary clues.

15.3.2.12 Character of Fire

The character of fire depends upon the nature and quantity of the substances burnt and the conditions prevailing at the scene. It is, therefore, useful to note down the elements of fire, which will reveal the origin, history and the progress of the fire.

Most of the characteristics of the fire can be observed only when the fire is in progress. Therefore, if the investigating officer is not present at that time, he should get the information from the witnesses especially from the fire brigade staff who observed the fire in progress and controlled it. Media person and their photographs are other important sources of evidence of the character of fire. The media photographers are requested to provide the images.

A new source of evidence of the character of fire has come up It is the mobile phone Many onlookers have phones with excellent camera facilities. The public is requested to E-mail the photographs.

Temperature of the fire is estimated from the havoc caused and the colour of the flame.

The elements of the character of fire are:

1. Extent of flame and its colour: The colour of the flame is dependent upon the material/ temperature. The table below may provide some idea:

Table 15.4

Smoke and Flame Colours

Material	Smoke Colour	Flame Colour
Petroleum products (Petrol, Kerosene, Diesel)	Black	Yellow to white
Paper, cloth, wood	Grey to brown	Yellow to red
Hey, dry leaves/twigs	White	–
Turpentine/thinners	Brownish black	Yellow to red, white
Coal tar	Black	–

2. Temperature developed: An idea of the temperature of the fire can be had from the colour of the flame:

Table 15.5

Flame Colour-temperature Relationship

Flame Colour	Temperature
Dull Red	500 — 600° C
Dark Red	600 — 800° C
Bright Red	800 — 1000° C
Orange	1000 — 1200° C
Brighter Yellow	1200 — 1400° C
White	1400° — and above

Table 15.6

Melting Points of Metals

Metal:	Alumi-num	Brass	Cast iron	Chro-mium	Copper	Gold	Iron	Lead	Nickel	Silver	Steel
MP°C	660	850-1000	1232	1857	1084	1 064	1535	327	1455	9621	1427

Table 15.7

Effect of Heat on Wood

Temperature °C	110	150	230	250	300
Effect	Water/ aromatics evaporate	Resins ooze CO given off	Carbonisation starts	Pyrophoric carbon	Charcoal formation

3. Odour of the burning material

Petroleum products, turpentine, rubber insulation give characteristic odour on burning. The odour is known not only to the specialist but also to the novice. Likewise, if explosive is used to initiate fire, it can be guessed from their characteristic odour. The various chemicals also give characteristic smells. The general public does not know them but they can tell whether the odour is:

1. Choking
2. Pungent
3. Pleasant

Sulphur oxides, oxides of nitrogen give pungent odour. Polyvinyl Chloride (PVC) plastics produce Chlorine, on burning, which has a pungent odour.

4. Nature and extent of smoke deposit patterns, their volume and the colour of smoke.
5. Spread pattern of fire.
6. The havoc caused.

They give the areas where combustible material was kept. They may also indicate the nature of the material burnt.

Smoke deposit patterns are observed after the fire has been subdued. They are mutilated sometimes in controlling the fire.

15.4 PROBLEMS/POSSIBILITIES

The main purpose of the investigation of fire is to find whether it is arson accidental fire, spontaneous fire or an act of God. Yet, more important problem is to identify the arsonist and link him with the arson, beyond a reasonable doubt. A significant problem has emerged in significant volume is bride burning/dowry deaths. Is the bride burning a case of suicide, murder or accident?

All cases of fire need intensive/extensive investigations and to locate/collect/get evaluated evidentiary clues to provide real justice to all concerned. Linked problems are; firstly, to find out the physical cause of the fire, secondly to know the *modus operandi* of the arsonist, and thirdly, to find ways and means to prevent all types of future fires.

In summary, the aims of the fire investigations are to determine:

1. the nature of fire: arson, accidental, spontaneous or Act of God?
2. the cause of fire and to use the knowledge to prevent future fires.
3. the nature and quantity of the materials burnt.
4. cause of the spread of fire and to modify building constructional strategy.
5. evidence to link the culprit with arson/fire.
6. the extent of damage and loss.
7. evidence of other crime, if any.
8. the *modus operandi.*
9. the origin (the seat) of fire.

In bride burning (dowry death) cases, the investigator must find out-:

- **Psychological autopsy** of the bride; to ascertain her compulsions: health. Social, financial, familial,
- the bride committed suicide; or, was she murdered?
- the bride was tortured/ill-treated, to force her to commit suicide.
- the suicide letter/note, allegedly written by the victim, is genuine or fake.
- the source of initiators, accelerators, promoters.
- there were their residues at the scene.
- the bride was burnt alive or dead.
- the bride mentally was disturbed.

15.5 EVALUATION

Evaluation of fires requires ample time, patience, perseverance and knowledge on technical matters. The investigating officer should seek help from all the possible sources.

15.5.1 Expert Help

The clues, which indicate whether the fire is malicious or accidental in nature or those clues, which can connect the criminal with the fire, are available at the scene of occurrence. They are associated with debris. It is, therefore, essential that the expert help is procured at an early stage so that the expert examines the scene in its nascent form. Once the scene of fire is mishandled, the possible clues may get lost in the debris.

The following experts are helpful in the investigation of arson/fires:

15.5.1.1 Fire Brigade Staff

The fire brigade staff has extensive experience of all types of fires. They, from the character of fire, the colour of the flame and the smell of the material burnt, can indicate the nature of materials burnt (the accelerators, foreign substances). They also indicate as to how the fire spread and how it was extinguished. The IO obtains the following specific information from them:

- The nature of the material burnt.
- The seat (origin) of fire
- The number of seats of fire, One or more than one. More than one seat indicate arson usually
- Direction of spread of fire
- The extent of fire
- *Modus operandi* for the suppression of fire

15.5.1.2 Architect

Architect is the person who prepared/supervised the construction of the building, which got burnt. He can provide:

- Building Plan
- Constructional material used and their combustibility

15.5.1.3 Electrical Engineer

The electrical engineer knows about the electrical installations in the building. He:

- gives the wiring layout in the building drawing.
- identify electrical short-circuiting as the cause of fire.
- indicates the load capacity of the installed electric system and the load capacity of the installations (gadgets).
- locates possible fault line, which started the fire.

The engineer, who had laid down the wiring of the installation, should be called for help, whenever available.

15.5.1.4 Inspector of Explosives

If an explosive is suspected to explode and cause fire, the help of an explosive expert is necessary. He gives the nature, quality, and quantity of the explosive involved in the fire. He also helps to locate evidence relating to the explosion and the explosive.

15.5.1.5 Forensic Scientists

The Forensic Scientist helps to:

- locate the seat(s) of origin of fire.
- identify initiators/accelerators/combustible materials.
- assess the quantity of the combustible material consumed by the fire.
- locate and collect the correct samples of clue materials to link the crime and criminal.
- decide if the fire is accidental or arson.

A forensic expert is indispensable in the investigation of fires. He should always be associated in the examination of the scene of fire.

15.5.1.6 Photographer

Police photographer establishes the location of the scene and the clue materials. Photographs in *situ* give information about the extent of fire, nature of the materials burnt and the direction of the spread of fire.

15.5.1.7 Videographer

Videography of the burning process presents an overall collective clear picture of the burning scene. The scene must always be video graphed for the record, before it is processed.

15.5.1.8 Occupants

Occupants of the house are the most important witnesses. They help to:

- Provide a correct inventory of the articles present on the premises. It is prepared before searching the scene.
- Identify the foreign articles present at or around the scene and in the debris.
- Understand the various stages of the spread of fire.
- Ascertain the nature of the initiator/accelerators and the burnt material.
- Indicate/fix possible suspect(s) in an arson case.

15.5.2 Systematic Investigation

A Special Investigation Team (SIT) is constituted for systematic and planned investigation. It:

15.5.2.1 Proves Malicious Intent

The following circumstances indicate malicious fire (arson):

- More than one seats of fire, without interconnection between them
- Presence of foreign inflammable materials
- Evidence of extraneous initiators
- Discovery of evidence relating to some other crime
- Destruction of only account-books and other important documents

- Removal of valuables before the start of the fire
- Release of animals before the start of fire
- Occurrence of fire soon after the receipt of a consignment of goods, the consignment may contain only spurious goods
- Recent heavy insurance of the premises
- Presence of worthless combustible stores of recent origin
- One and the same individual seen at a number of fires. He is probably a pyromaniac
- The character of fire if different from the one possible from the stores on the premises
- The occurrence of similar other fires
- The evidence of broken doors, windows, skylights, ventilators or even walls
- Tampering with fire-extinguishing devices

Fig. 15.6

Two buses burnt simultaneously at a bus stand.
Their similar fire spread pattern, the extent and the time element indicated arson

15.5.2.2 Eliminates Accidental Cause

The team eliminates the accidental origin of fire with the help of various experts if they do not find:

- Any defective heating appliance
- Any short-circuiting or leakage in the electrical installations
- Any negligence in the disposal of live matches, cigarette ends, lighted candles, live fires, and running electric appliance or heat radiators

- The possibility of a spark/cinder from, a close-by factory, starting the fire
- The possibility of lightning causing the fire
- The possibility of spontaneous combustion

15.5.2.3 Procures Side Information

- Movement of a Pyromaniac in the locality
- Economic Position of the occupant of the premises, his latest dealings and commitments
- The position and relation of the owner with his competitors/rivals/enemies/tenants
- Condition of the building, its construction/stores and the nature of business[6] being carried out at the premises.
- The time at which the fire was noticed?
- Who noticed the fire first?
- Who extinguished the fire?
- How was the fire extinguished?
- The opinion of the fire brigade staff
- The alleged losses
- The estimated losses.

In a police institution, gas masks were stored in a closed room. One day, smoke was noticed to be coming out of the room. On opening the room, it was found that a large number of gas masks were smouldering. The fire was quickly put down. But the damage to the stores was extensive.

The author examined the premises to find out the cause of fire. No extraneous material was discovered at the site. The smoke patterns were then closely studied. It was found that the site of origin was adjacent to a broken power point, which had not been used for years. It was hidden behind a stack of the gas masks.

Two alternatives for the origin of the fire were possible.

1. *It could be the auto-oxidation (spontaneous combustion) of carbon contained in the gas masks.*
2. *It could be short-circuiting at the power point. The burnt gas masks were carefully studied. The burning was found from outside to inside. In spontaneous combustion, the fire would have spread from the carbon contained in the gas mask to outside, to its container. It was not found in any gas mask. The spontaneous combustion in the present case had, therefore, to be ruled out.*

Electrical short-circuiting had also to be eliminated because the electrical installations were in working order.

The weather conditions were then studied. It was found that weather was extremely dry for one month prior to the day of occurrence. On the day, there were clouds and lightning, though no lightning was observed to have fallen on the building.

It appeared that the static electricity in the clouds was conducted through the lightning conductor. But due to dry condition it was not dissipated completely. Probably a part of it got discharged through the open end of earth wire of the power point. The spark produced set the stack on fire.

6. Manufacturing of explosives/crackers/drugs are fire-prone activities.

It was a closed room. The fire, therefore, remained smouldering until it consumed most of the oxygen contained in the room. By then it was noticed and extinguished.

The closed room, thus, controlled fire, which could have consumed the building and its stores worth millions of rupees. (CH)

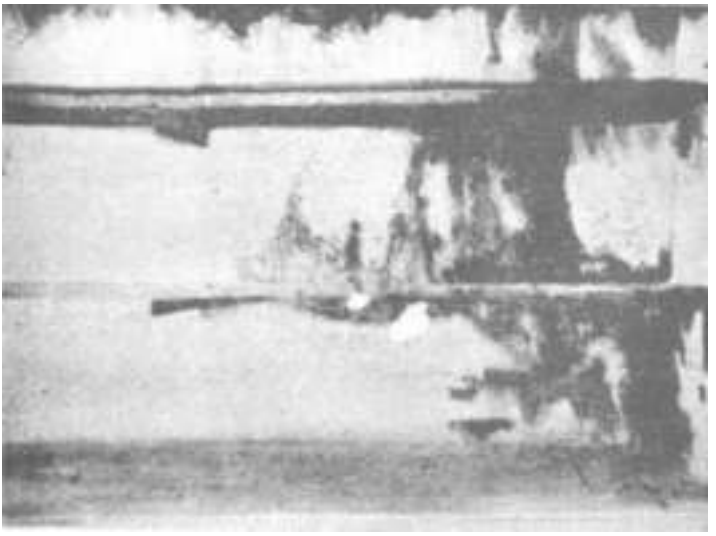

Fig. 15.7

Smoke patterns indicated the seat of fire and probable cause – an electric spark from a broken socket

Forensic Science Laboratories examine/evaluate the clues materials. The IO/SIT sends all the crime and corresponding sample clues to departmental laboratory, observing all legal formalities.

15.5.3 Laboratory Evaluations

Fire cases, especially arson cases, involve two types of evidence from the laboratory point of view:

1. General evidence like fingerprints, track marks, tool marks, abandoned articles, which is common to most of the crime. Such evidence has been discussed in various chapters of the book.
2. Fire related evidence, which is mostly of initiators, accelerants, fuel materials involved in arson/fire cases. Accelerants are the most frequently examined evidentiary clues.

Accelerants used are mostly petroleum products. Petrol and kerosene oil is the commonest, though diesel oil, mobile oil, lubricants are also used.

15.5.3.1 Extraction

The main problems of handling accelerants are:

- They are volatile and labile. The small amount in the debris evaporates if they are not processed early.
- They are often in extremely small amounts and dispersed in large amounts of substrata, the debris: may be soil, soot, wood or other debris like un-burnt,

semi-burnt materials: papers, garments and other household goods or vehicular upholstery. The evidence has to be collected.

The evidence is extracted from the substrata. The following techniques are common:

1. Floatation Process
2. Steam distillation
3. Solvent extraction
4. Solvent flushing
5. Vacuum distillation
6. Overhead space sampling

The success of extraction is dependent upon proper collection, efficient packing, expeditious and correct processing. If the package is not airtight, the vapours of the accelerants leak and the evidence is lost.

In a case of bride-burning case, the author visited the scene of occurrence. There was ample smell of kerosene oil in some carbonised pieces of clothes lying at the scene. The investigating officer was asked to collect/pack the clues correctly and dispatched them immediately. The parcels of the clues were received after about six months. They were packed in a cloth wrapper. Even the smell of the kerosene oil had vanished. No oil could be extracted! Was it negligence? Or, was it wilful destruction of evidence by replacing the clues? (CH)

In another cases, there was fire in an office. Apparently, embezzlement had been committed. The crime was being covered by destruction of the records. One of the involved persons, one evening, after the office hours, at about 17.30 hours sprinkled five litres of petrol on the files to be destroyed and left the office. He returned to the site at about 20.30 hours. He lighted a match and threw it inside through a broken window pane. There was an explosion. But before he could run away, hot air singed his face and stamped him as the perpetrator. The explosion alerted everybody and the police reached the scene. The author examined the scene. It was found that margins of some files had been scorched but not a single file was destroyed. From some of the files petrol was dripping. The explosion had broken many a door and window and cracked some wall portions also. But the intended fire did not spread.

The investigation agency took their time to send the liquid for examination. The laboratory analysis of the accelerants corresponded more to kerosene oil rather than to petrol mentioned in the scene of crime examination report. The variations had to be explained. (CH)

Formerly, floatation method, being the simplest, was commonly employed to extract the petroleum product vapours. It is the most inefficient method. It has been given up almost completely. Likewise, the identification of the product was being done through conventional methods: boiling point, boiling range, distillation curves, and refractive index. These tests required mostly amounts that often were not available and consequently could not be carried out. New technology has since come up. It needs only micro or nano-gram samples. The new techniques have revolutionised the identification of the involved products (Petrol? Kerosene? Diesel?). They also permit individualisation and comparison of the individual disputed vapours with a given sample. The techniques of choice are:

1) **Gas chromatography (GC):** Long capillary columns (hundreds of feet long) has separated hundreds of constituents and thus promoted individualisation of the sample. Columns of shorter length with suitable stationary phase packing material are also efficient. But the former have almost completely replaced the latter. Efficient detectors like electron capture are used in the process. Formerly thermal conductivity detectors were common. They are not so efficient.

2) **GC–MS:** Gas Chromatographs (GC) have been coupled with Mass Spectrographs (MS). They permit the identification of the individual constituents. The arrangement has increased the identification potential of the clue materials many times.

3) **Atomic Absorption Spectrophotometers (AAS):** AAS has been utilised to identify the metallic constituents of the materials. For example, lead in leaded petrol was identified by the technique. It is also used to analyse the residue of the chemical imitators.

4) **High Performance/Pressure Liquid Chromatography (HPLC).** It is being used increasingly to identify petroleum products. This technique proves, especially useful where the product used is a result of cracking. The cracking process introduces aromatic constituents, especially in petrol. They act as markers of the product.

The main hurdle in the identification of the accelerants is the variations of the evidentiary clues from the scene due to the action of fire on the petroleum products (varied evaporation changes the composition of the components). Secondly, pyrolysis inducts products of the substrata that may consist of plastic material. Though reference files are available for the former problem, after controlled evaporation of the lighter constituents in various percentages, yet it is best to do the homework with the involved product itself and prepare one's own reference product profiles. Products with a varied percentage of evaporation (say, 10%, 20%, 30% ….) are prepared and then compared with the product from the scene.

The pyrolysis of the plastic and other like materials at the scene is a more serious problem. It is tackled by pyrolysing similar plastic material at corresponding temperatures and durations to those at the scene and the products examined. However, it is more easily said than done. The seasoned analyst usually ignores the peaks of plastic products.

15.6 EXPERT TESTIMONY

Expert evidence in fire and arson cases relates to two examinations:

1. The scene of occurrence examination
2. The laboratory examination of the clue materials

15.6.1 Fire Scene Examiner

Qualified (educated, trained and experienced) scientists carry out Laboratory examination of the collected materials. But the collection of the clues is carried out by police or other investigators most of the time. They are not scientists. Unfortunately, a lot depends upon their initial examination of the scene and collection of the evidence thereof. They have to have proper education, training and experience. The National Fire Protection Association of USA[7] has suggested a list pertaining to knowledge/skill requirements, which include:

1. Fire science;
2. Fire chemistry;
3. Thermodynamics;
4. Thermometry;
5. Fire dynamics;
6. Explosion dynamics;
7. Computer fire modelling;
8. Fire investigation;

7. National Fire Protection Association (NFPA), USA Document, No. 1033, Standard for Professional Requirements for Fire Investigator.

9. Fire analysis;
10. Fire investigation methodology;
11. Fire investigation technology;
12. Hazardous materials;
13. Failure analysis and analytical tools;

It is a tall order. In India, there are no such training programs.

15.6.2 Crime Scene Report

The scene of occurrence report should provide data/information on the following heads:

1. Occurrence: place, date and time
2. Request for investigation: reference
3. Arrival at the scene
4. Weather conditions
5. Fire control mode
6. Fire-affected premises
7. Fire-affected areas
8. Fire-affecting materials — details
9. Evidence located
10. Evidence collected: General clue materials, fire-related due materials, initiation device or remnants thereof, accelerants or residues thereof, promoters or residues thereof, smoke patterns photographs, smoke residues, residues of the alleged burnt materials, remnants of explosion, if any.
11. Fire safety equipment, if any: Tampered? Removed? Used or not used?
12. Informational statement or report from: Fire-brigade staff, Owner(s)/tenant(s), the injured, the report of the first viewer, Media people.
13. Expert help obtained
14. The crime scene report indicates:
    - Absence/presence of accidental cause, with reasons
    - Presence/absence of arson, with reasons
    - Possible leads, for further investigations
    - Elimination of possible cause(s)
15. Documentation of the scene; videograph, photographs, Sketches, textual description.

15.6.3 Laboratory Reports

The laboratory report is furnished on a standard format devised by the laboratory for the purpose. It contains all the relevant information about the crime, about the exhibits, mode and date of receipts, the examination process, the observations and the conclusion reached. The necessary diagrams, charts, photographs, are furnished along with the report.

The absence of other possible modes of fire and other negative evidence is also discussed succinctly and reasoned out lucidly.

Fig. 15.8

New York Twin Tower blast/holocaust. The worst Arson-cum-Blast case of 21st Century

15.7 ADDITIONAL READING

A.K. Furton. 2004. *Analysis and Interpretation of Fire Scene Evidence.* CRC Press.

15.8 CASE LAW

15.8.1 Burning[8]

Author's Summary

The culprit poured kerosene oil on the clothes of the victim and put the clothes on fire. The act was patently murderous and the victim died. No special knowledge that the act would kill the victim was needed to know that. The lower courts wrongly acquitted him. He was convicted for culpable homicide under Section 300 (4) IPC.

8. *State of Madhya Pradesh v Ram Prasad*, AIR 1968 SC 881 : (1968) 2 SCR 522 : 1986 Cr L J 1025 (SC).

Relevant Extracts (Verbatim)

In the present case, Ram Prasad poured kerosene upon the clothes of Mst. Rajji and set fire to those clothes. It is obvious that such fire spreads rapidly and burns extensively. No special knowledge is needed to know that one may cause death by burning if he sets fire to the clothes of a person. Therefore, it is obvious that Ram Prasad must have known that he was running the risk of causing the death of Rajji or such bodily injury as was likely to cause her death. As he had no excuse for incurring that risk the offence must be taken to fall within the fourth clause of section 300, Indian Penal Code, in other words, his offence was culpable homicide amounting to murder even if he did not intend causing the death of Mst. Rajji. He committed an act so imminently dangerous that it was in all probability likely to cause death. We are accordingly of the opinion that the High Court and the Sessions Judge were both wrong in holding that the offence did not fall within murder.

15.8.2 Negligence[9]

Author's Summary

This is a case of extreme negligence. 4 burners were allowed to burn near the place where turpentine and other combustible materials were stored at a distance of about 8 feet against the condition of the licence. The turpentine vapours caught fire and engulfed the premises. 7 persons were burnt. The owner was rightly convicted.

Relevant Extracts (Verbatim)

We have already pointed out that four burners were in one corner of the room and combustible matter was in another corner of the same room and there was only a distance of 8 or 10 feet between the two. The burners were lighted against the general as well as the special conditions of the licence for storage granted to the appellant. The proximity of naked fire to the stores of turpentine and varnish is in our opinion always a matter of probable danger to human life, namely, the life of the persons working in the room. This was particularly so with respect to turpentine which has a low flash point, *i.e*. 76°F to 110°F. The use of naked fire could, in conceivable circumstances, even raise the temperature of the room itself above the flash point of turpentine and if the turpentine ever happened to be exposed it might easily catch fire. There was, in our opinion, therefore, always a probable danger to human life by the appellant negligently or knowingly omitting to take proper care in the matter of the four burners and turpentine and varnish. His action in allowing burners to be lighted in the room without any safeguard did in our opinion amount to omission to take such order with fire and combustible matter as would be sufficient to guard against probable danger to human life. We can only say that it was lucky that fire had not broken out earlier. But there can be no doubt that the omission of the appellant to take proper care with burners in particular when such combustible matter as turpentine in large quantity was stored at a distance of 8 to 10 feet from the burners was such omission as amounted to insufficient guard against probable danger to human life. Finally when we remember that all this was done in breach of the general and special conditions of the licence given to the appellant for storage of turpentine, varnish and paints, we have no doubt that the appellant knowingly, or at least negligently, failed to take such order with fire and the combustible matter as would be sufficient to guard against any probable danger to human life. In the circumstances we are of opinion that the appellant has been rightly convicted under section 285 of the Indian Penal Code. Considering that seven lives have

9. *Kurban Hussein Mohammedali v State Of Maharashtra*, AIR 1965 SC 1616.

been lost on account of the negligence of the appellant in this connection, the sentence of six months rigorous imprisonment which is the maximum provided under section 285 cannot be said to be harsh[10].

15.8.3 Bride-Burning[11]

Author's Summary

In this case, the culprit murdered his wife and attempted to make it a case of suicide by self-immolation. The court found plenty of evidence to indicate it was not a suicide. The position of the body, the burn pattern on it, cleanliness of the scene, absence of burning of combustible materials close to the burnt body and the conduct of the culprit proved a case of murder by burning.

Relevant Extracts (Verbatim)

The city inspector, Rameshwar Kumar Sharma, P.W., had also arranged to get the dead body in the closet photographed from Gurcharan Singh, Photographer, P.W. 9. Two photographs, exhibits P. 1 and P. 2, along with their negatives, are also on the record. These photographs were admitted by all the four accused. From photographs, exhibits P. 1 and P. 2, it is quite evident that the dead body was placed just at the threshold of the door which was the entry of the closet. The dead body appears to have occupied the entire breadth of the store. The head and the back of the dead body were raised against the wall in such a position that the body could not fall. It also appeared that the legs could not be stretched beyond the opposite wall. In this closet were also found various household articles including drums etc. From a look at the photographs when perused with the statement of the doctor, which has been reproduced above, it becomes crystal clear that the right side of the dead body except the portion just towards the upper right thigh in contact with the mattress on which the dead body was seated had not been burnt. The blouse on the right side except for a few burnt portions was intact. According to the doctor the blue colour of the blouse had not been affected. The petticoat or the sari cloth on the left leg seems not to have been burnt. All the tell-tale burn marks were on the left arm, left shoulder, left chest and the left side of the face and head. All the articles lying in the store near the dead body do not seem to be disturbed. At point D in the photograph, Exhibit P. 1, some article appears to be in close contact with the left side of the dead body. A basket appears to be lying near the left knee, but none of the articles appears to have been disturbed. Plastic bangles on the right arm also do not appear to have been at all burnt. A close look at the second photograph, Exhibit P. 2, which was taken by the photographer from the back, shows that the left upper arm and the left shoulder are completely burnt mass and below the elbow nothing is observable. Towards the left of point B and the right of point Y there appears to be some portion of either ulna or radius which in the opinion of the doctor was jutting out from the elbow joint in a completely burnt condition. There does not appear to be anything below figure Y. The doctor was exhaustively cross-examined at this point by the trial court. In reply to one question, it was stated that the left arm up to the elbow was so much burnt that there was no flesh left and the bones were charred to ashes. In reply to another question, it was clarified that "the burnt bones turned to ashes just like remains left after the cremation". It was also deposed that only the upper two-thirds portion of the radius and ulna were jutting from the elbow joint and the rest had fallen off. In reply to another question it was stated that the rest of the portion was missing. However, after the

10. *Kurban Hussein Mohamedalli Rangawalla v State of Maharashtra*, 1965 (2) Cr L J 550 : AIR 1965 SC 1616 : (1965) 1 SCWR 718.
11. *Kuldip Sham v State of Punjab*, 1980 Cr LJ 75.

statement had been completed, the doctor, before signing the statement, without the order of the court and without bringing the same to the notice of the court, himself added the word "not" thereby showing "the rest of the portion was not missing."

A close perusal of the statement of Dr. G.D. Chawla, P.W., leaves strong impact on the mind that it was his clear statement in the first instance that the portion below the elbow joint of the left arm was missing and had been completely burnt to ashes. Subsequently, however, he made a deliberate attempt to wriggle out of it and to make equivocal statement that some bones were jutting out of the elbow joint.

According to the trial court, the burns on the dead body of Usha Rani, deceased, were not ante-mortem and that one-third portion of the left arm below the elbow was missing before the dead body was put to fire and the same was done in order to conceal the injuries which may have been inflicted on that part before her death. It was also pointed out that the doctor had not dissected the head and the face from which also correct opinion could be formed if some injuries had been inflicted on the said part of the body. The doctor, however, categorically stated that the burns on the dead body of Usha Rani were ante-mortem in nature and were sufficient to cause her death in the ordinary course of nature. Though it is not possible to form a categorical opinion from the material on the record if the burns on the dead body were ante-mortem or post-mortem in view of the categorical statement of the doctor, yet from the oral evidence of the witnesses who had seen the dead body lying in the closet as referred to above, the two photographs and the statement of the doctor, no doubt is left that even if it was a case of death by fire and the consequential burns, the body of Usha Rani had not been subject to fire in the closet and that the dead body was placed therein only after death. If Usha Rani had caught fire whether accidentally or intentionally to commit suicide, after the body caught fire, she must have writhed with pain and made frantic movements of hands and legs and the natural consequence would be that the articles lying near the dead body must have been disturbed. Besides, the wall, the door and the threshold where the body was seated or was in contact must have also borne the impact of fire and the smoke. At least, the rice lying in the thali could not but show signs of the impact of intensive fire. It is clear from the photograph, Exhibit P.1 that a cloth is covering the dead body which did not have any sign of fire or even smoke. Indisputably, this cloth had been put on her after she had died. Even according to Mohan Lal, C.W., who had just followed Ram Lal, accused, after Shanti Devi, accused had raised hue and cry, he did not see any fire or smoke. There is absolutely no evidence on the record to show if any person had seen the fire or the smoke coming out of the closet. Thus, the only conclusion possible is that Usha Rani was already dead whether by fire or otherwise when her dead body was placed in the closet.

After having arrived at the above conclusion, the conduct of Kuldip Sham, accused, assumes considerable importance as in a case based only on circumstantial evidence, the conduct of the accused is also an important link in the chain of incriminating circumstances to arrive at the correct conclusion. According to the statement of Kuldip Sham, accused, after the close of the prosecution evidence, he used to go for a morning walk every day and on March 28, 1976, had gone for a walk at 6.15 a.m. along with his partner and friend, Dharam Vir Mahajan, C.W. 1. At that time, his wife Usha Rani was quite fit and alive. When he returned at about 6.45 a.m., he found a crowd of people having collected in front of his house. It was then that he came to know that Usha Rani was dead and her dead body was lying in the closet. He further stated that Usha Rani had died by sprinkling kerosene oil on her body and then putting herself on fire after he had left the house for a walk in the morning. This defence version stands completely negatived and contradicted by the convincing evidence and the objective circumstances on the record. As discussed above in detail, Usha Rani had not caught fire in the closet but her dead body had been placed there subsequent to her tragic end. Even Mohan

Lal C.W., who had immediately followed Ram Lal, accused, on hearing the cries of Shanti Devi, accused, had not seen any sign of fire or smoke coming out of the closet at any time in the morning. The version of the accused that he had gone for a morning walk with Dharam Vir Mahajan. C.W., was also belied by the deposition of the later as a court witness (C.W.1). According to his deposition, he did not even know Kuldip Sham accused, and I had not gone with him for a morning walk.

This conduct of the accused in fabricating a story that he had gone out of the house in the morning and that it was in his absence within a short span of half an hour or so that his wife Usha Rani committed suicide is a strong indication of his guilty mind and a deliberate attempt on his part in order to conceal the commission of offence. If it was Kuldip Sham, accused, and Usha Rani, who had slept in the house on the relevant night, and Usha Rani had for one reason or the other, committed suicide or had died by accident, it was not probable that Kuldip Sham, accused, would concoct such a cock and bull story. The relations between the two being strained and Kuldip Sham being aggrieved against his wife whether on account of the non-fulfillment of his demand for more dowry or because he suspected her fidelity on account of the seizure of the letter addressed to her by some other person, the dead body of Usha Rani found in the closet in suspicious and mysterious manner and the deliberate attempt on the part of the accused to concoct a false story are such incriminating circumstances from which no other conclusion is possible except that it was Kuldip Sham, accused, who was instrumental in committing the murder of his wife by putting her on fire or in any other manner. It has been held in *Deonandan Mishra v State of Bihar*[12], that in case of a murder when there is no direct evidence and the prosecution case is based only on circumstantial evidence, absence of explanation or false explanation by the accused serves as an additional link in the chain of circumstances to connect the accused with the offence. In the present case, as discussed above, the accused, Kuldip Sham, came out with statement in explanation regarding the cause of death of his wife which has been found to be palpably false.

15.8.4 Accidental, suicidal or Homicidal Burning[13]

Author's Summary

It was an incompetent attempt to dub 2 murders as accidental deaths. The culprit killed his mother and wife and placed the burnt bodies on 2 beds in the same room. He alleged that they caught fire from a kerosene lamp and got burnt. All the evidence indicated the falsehood of the story.

Relevant Extracts (Verbatim)

The manner in which the charred bodies of the two women *viz.,* wife and mother of accused were found lying on the cot and cradle in the same room completely excludes the possibility of their death either by an accidental fire or suicide. It is impossible to believe that the flame of a small kerosene oil lamp could have simultaneously ignited either the clothes or the bed of both these women when they were lying in two separate beds separated by a distance of at least 2 feet as has been proved by evidence. Even assuming that the bed or clothes of any one of them were ignited accidentally in this manner that does not explain the setting of fire to the clothes and bed of the other woman. Neither of these two women was infirm or disabled in any manner. There is absolutely no reason why even that women whose clothes or bed may have caught fire could not get up from the bed and rush for help and the other woman would

12. AIR 1955 SC 801 : 1955 Cr LJ 1647 : (1955) 2 SCR 570.
13. 1979 Cr LJ 94 (NOC) 213.

not come to her rescue leaving her own bed. Even assuming the improbable that the clothes or bed of both of them simultaneously caught fire, neither their clothes nor bed comprised of any highly inflammable substance so that the flames could spontaneously engulf them completely. At any rate, even in that situation, they would not remain lying coolly in the bed to let the fire consume their bodies in the manner they were found next morning. The suggestion of an accidental fire catching both or either of them is impossible to accept. On his own admission accused was the first person to enter that room and to find both the bodies totally charred and almost wholly consumed by fire. In case of an accidental fire catching these women, their bodies would not be found lying in the bed as they were discovered next morning.

CHAPTER 16

MOTOR VEHICLES

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Fig. 16.1
Multiple vehicle crash

16.1 GENERAL

Motor vehicles frequently figure in criminal investigations. They are involved in road accidents. The criminals use them to reach and leave the crime scene or to transport incriminating articles from the scene to the place of disposal. Heinous crimes like murder rape and kidnapping are committed in vehicles. Vehicles are also used to crush/kill persons. In short, they are used in all sorts of crimes including thefts, smuggling, rape, riots, robberies, dacoities and murders.

The vehicles are also the objects of crime. They are burnt/destroyed to claim insurance money. They are stolen for sale or sometimes for joy rides. The functional parts of the vehicle are tampered to cause accident when they are driven.

Sometimes a crime is committed in the vehicle itself, making it the crime scene. Physical assaults, looting, kidnapping, murders, rapes and for carrying and destroying incriminating evidence are quite common crimes committed in vehicles

Vehicles are increasingly becoming the object of crime. They are stolen and after changing the identity parameters (Engine/chassis/registration numbers, paint, decorative additions, etc.), they are sold. They are stripped and parts are sold. It is a flourishing trade in some big cities. They are often damaged for revenge/vendetta and in political or communal riots.

The evidence on the vehicles helps to establish *corpus delicti,* links the culprit with the crime scene and the victim. They help to reconstruct the crime and the sequence of events.

The number of motor vehicles on the Indian roads was very small prior to and even after independence in India. It slowly increased in the first few decades after independence. But the advent of the 21st century saw a vehicular explosion. It ushered in vehicular era in India. The number of vehicles, especially of light transport vehicle has increased many folds. It is still increasing exponentially. The increase in vehicular crimes (involving vehicles) is natural fallout of the explosion of vehicular use.

16.1.1 Crimes and Vehicles

Motor vehicles are used, now increasingly, in the commission of practically all types of crimes:

1. The criminal may hire a taxi and order it to a secluded place. The criminals may rob/manhandle/kill the driver. A road accident may then be simulated.

2. Criminals molest/assault young females travelling alone in vehicles. Kidnapping/rape/murder has become a common occurrence in vehicles.
3. Vehicles are being used increasingly to kidnap/manhandle/molest/kill rivals/enemies.
4. Vehicles are used to transport stolen/smuggled/contraband goods/objects.
5. Vehicles are being used to transport incriminating evidence from the place of occurrence to a safe place, for hiding or for destruction.
6. Vehicles are used sometimes to kill a person by running over the victim or by causing fatal accidents.
7. Terrorists in Pakistan (and elsewhere) are using vehicles, filled with explosives, for suicidal bombing with great effect, in terms of loss of life and property.

Road accidents, however, account for the maximum number of vehicular crimes in India. They were sensational affair in the past. Not so now, it is a common occurrence. We are fast catching up with the western countries in respect of incidences of road accidents.

16.2 NATURE

The variety of the vehicles on the Indian roads is very large. In addition to the non-mechanized transport, we have auto-cycles, scooters, motor cycles, cars, buses, trucks, tractors, bulldozers and road-rollers. The variety of the vehicles and their number is ever increasing and hence the number of accidents is increasing.

Vehicles also kill/injure pedestrians in road accidents.

Table 16.1

Road accidents covering the period from 2005 to 2016

Year	Number of Accidents		Number of Persons		Accident Severity*
	Total	Fatal	Killed	Injured	
2005	4,39,255	83,491 (19.0)	94,968	465,282	21.6
2006	4,60,920	93,917 (20.4)	105,749	496,481	22.9
2007	4,79,216	1,01,161 (21.1)	114,444	513,340	23.9
2008	4,84,704	1,06,591 (22.0)	119,860	523,193	24.7
2009	4,86,384	1,10,993 (22.8)	125,660	515,458	25.8
2010	4,99,628	1,19,558 (23.9)	134,513	527,512	26.9
2011	4,97,686	1,21,618 (24.4)	1,42,485	5,11,394	28.6
2012	4,90,383	1,23,093 (25.1)	1,38,258	5,09,667	28.2
2013	4,86,476	1,22,589 (25.2)	1,37,572	4,94,893	28.3
2014	4,89,400	1,25,828 (25.7)	1,39,671	4,93,474	28.5
2015	5,01,423	1,31,726 (26.3)	1,46,133	5,00,279	29.1
2016	4,80,652	1,36,071 (28.3)	1,50,785	4,94,624	31.4

Source: Information supplied by States/UTs (Police Departments).
Figures within parentheses indicate share of fatal accidents in total accidents.
* Number of persons killed per 100 accidents

During 2016, there were **55 road accidents and 17 deaths every hour**, in India.

The analysis of road accident data in 2015 reveals that motorised vehicles accounted for 95.5% of the total road accidents. Amongst the vehicle categories, two-wheelers accounted for the highest share in total road accidents (28.8%) in 2015 followed by cars, jeeps and taxis (23.6%); trucks, tempos, tractors and other articulated vehicles (19.7%), other motor vehicles (9%), buses (8.3%) and auto rickshaws (6.1%).

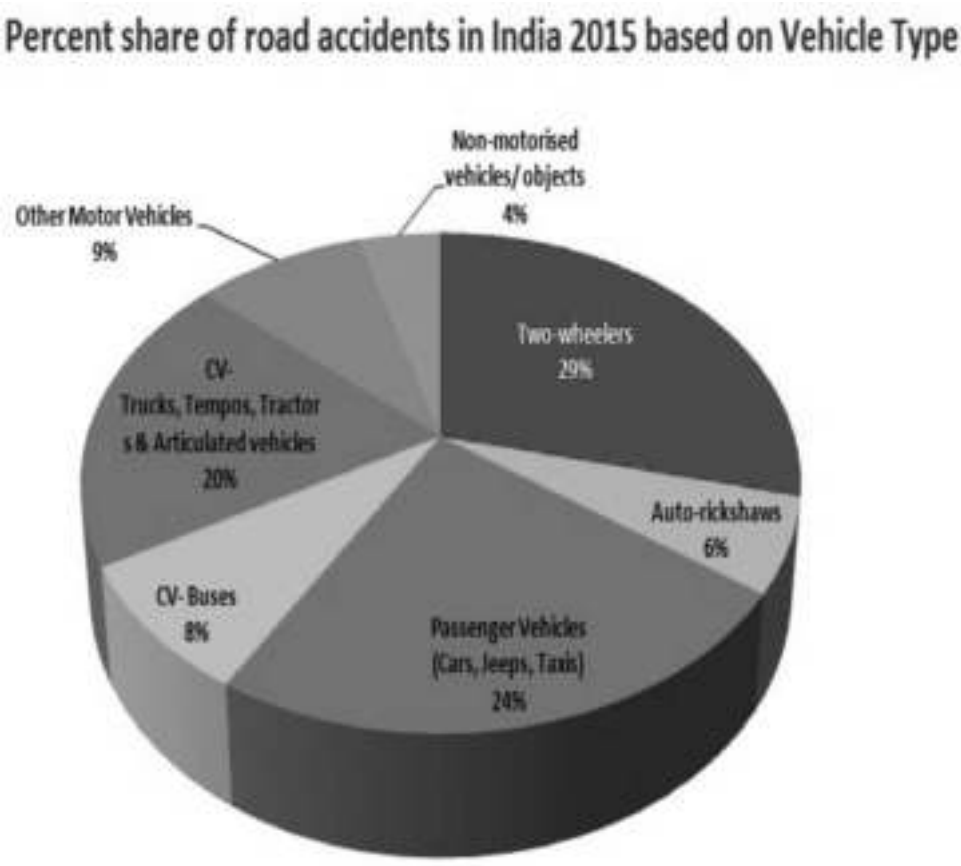
Percent share of road accidents in India 2015 based on Vehicle Type
Non-motorised vehicles/objects 4%
Other Motor Vehicles 9%
Two-wheelers 29%
CV- Trucks, Tempos, Tractors & Articulated vehicles 20%
Auto-rickshaws 6%
CV- Buses 8%
Passenger Vehicles (Cars, Jeeps, Taxis) 24%

Fig. 16.2

As for the road fatalities[1], 31.5% two-wheeler riders died in road accidents in 2015. They are the most vulnerable and unprotected road users. Other road users killed in road accidents are those in cars, taxis, vans and other light and medium motor vehicles (17.2%), other motor vehicles (12.7%), trucks (11.4%), pedestrians (9.5%), buses (7.4%), auto-rickshaws (5.0%) and others (3.2%).

1. **Driver at fault in most accidents**
As per the report, driver's fault is the single most factor responsible for road accidents, accounting for 77.1% of total road accidents during 2015; killing 64,633 persons mainly due to exceeding lawful speed/over speeding.

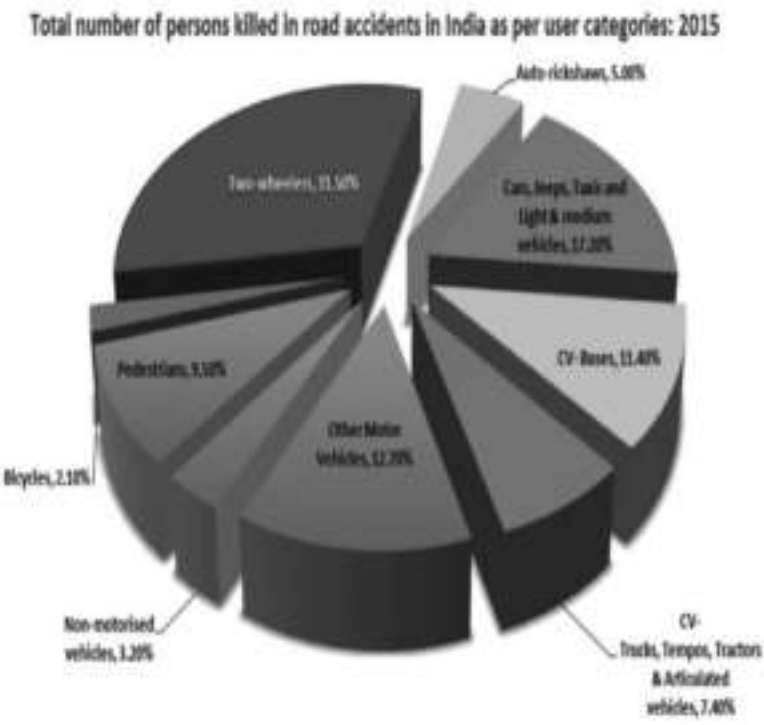
Total number of persons killed in road accidents in India as per user categories: 2015
Auto-rickshaws, 5.00%
Two-wheelers, 33.50%
Cars, Jeeps, Taxis and light & medium vehicles, 17.20%
CV- Buses, 11.40%
Pedestrians, 9.50%
Other Motor vehicles, 12.20%
Bicycles, 2.10%
Non-motorised vehicles, 3.20%
CV- Trucks, Tempos, Tractors & Articulated vehicles, 7.40%

Fig. 16.3

The commercial vehicles category accounted for the highest proportion of persons killed (25.6%) out of the total number of persons killed in the country during the calendar year 2015.

Meanwhile, the share of accidents, persons killed and injured in total accidents in the country caused by non-motorised vehicles such as cycles, cycle rickshaws, hand-drawn and animal-drawn vehicles are 1.10%, 1.57% and 0.88% respectively.

16.2.1 Types of Accidents

There are different types of road accidents, including the following:

1. **Head on collision**

   Head on collusion are most frequent. The collision may take place with another vehicle, cyclist, and pedestrian or with an animal. Many lives are lost in such collisions every year.

2. **Lane departure accidents**

   Such accidents usually occur at night. The driver momentarily falls asleep. The vehicle moves out of the lane, hits the embankment, other vehicle or some other object.

3. **Vehicles Roll over**

   Rollovers are common in hills where a vehicle going on high speed is unable to manage the curve and rolls over, often with extensive loss of lives and limbs.

4. Accidents at junctions

Vehicular accidents at road junctions are quite frequent. Majority of them are not serious. Creation of roundabout has reduced the number of such accidents.

16.2.2 Causes of Road Accidents

Road accidents may occur due to any of the following causes:

16.2.2.1 The Driver

The driver is the main cause of accidents. The situations under which he causes accidents are varied:

1. He may be tired. He falls asleep momentarily, and he loses control of the vehicle.
2. He may suffer from some fit of illness and is unable to control the vehicle.
3. He may be driving the vehicle at a high speed. Some unexpected obstruction (animal, man, child, stone, pit or other vehicle) suddenly comes in his way to cause an accident.
4. The driver may be drunk or intoxicated and thus his judgment is impaired.
5. The driver may have taken stimulant(s) to keep awake and alert. The effect of the drug wears off and extreme fatigue (and drowsiness) takes over the driver. The accident occurs.
6. The driver's attention is diverted due to some unusual occurrence inside/outside the vehicle and accident takes place.
7. The driver may cause an accident in the struggle to save some pedestrian/cyclist/animal.

16.2.2.2 The Vehicle

1. The brakes fail.
2. The steering handle does not function properly.
3. The lights of the vehicle are faulty.
4. Some other machinery of the vehicle fails.
5. A tyre bursts.
6. The tyre wheel may break loose from the vehicle.
7. There may be a fire in the engine

16.2.2.3 The Road

1. It may be slippery.
2. It may be bumpy.
3. It may have boulders or pits.
4. It may suddenly give way, in hilly areas and the vehicle falls down into a gorge.
5. It may be narrow with sharp curves.
6. There is a sudden obstruction on the road.

A person was driving at high speed. All of sudden a wild cow (Neel Gai), dazzled by the light, came in the way and struck against the windshield. It was broken. The force was so much that the animal was propelled inside. It struck the passenger sitting on the front seat and killed her. (CH)

16.2.2.4 The Victim

1. He did not observe the traffic rules.
2. He misjudged the safety margin/zone.
3. He is practising stunt driving.
4. He miscalculates the speed, the time and the distance while crossing the road.
5. He may be drunk and suddenly comes before the vehicle going at high speed.
6. He may be a maniac. He comes in the way of the vehicle without knowing or caring for the consequences.

Table 16.2

Major Causes of Road Accident Deaths during 2014, (NCRB)

1.	**Over-speeding**	**47.9%**
2.	**Careless driving**	**41.5%**
3.	**Poor weather conditions**	**5.3%**
4.	**Mechanical defects in vehicles**	**2.8%**

Table 16.3

Number of road accidents and number of persons Involved: 2002 to 2011[2]

Year	Number of accidents		Number of persons		Accident severity*
	Total	Fatal	Killed	Injured	
2002	407497	73,650 (18.1)	84,674	4,08,711	20.8
2003	406726	73,589 (18.1)	85,998	4,35,122	21.1
2004	429910	79,357 (18.5)	92,618	4,64,521	21.5
2005	439255	83,491 (19.0)	94,968	4,65,282	21.6
2006	460920	93,917 (20.4)	1,05,749	4,96,481	22.9
2007	479216	1,01,161 (21.1)	1,14,444	5,13,340	23.9
2008	484704	1,06,591 (22.0)	1,19,860	5,23,193	24.7
2009	486384	1,10,993 (22.8)	1,25,660	5,15,458	25.8
2010	499628	1,19,558 (23.9)	1,34,513	5,27,512	26.9
2011(P)	497686	1,21,618 (24.4)	1,42,485	5,11,394	28.6

P: Provisional, Source: Information supplied by States/UTs (Police Departments),
Figures within parentheses indicate share of fatal accidents to total accidents.
*Accident Severity: No. of Persons killed per 100 accidents

2. 4.96 lakh traffic accidents, 1.8 lakh deaths in 2015. (NCRB). WHO gives the death toll more than **two** lakhs.

Table 16.4

Accident Deaths in India, during 2010-2015 (NCRB)

Year	Deaths
2010	1,33,938
2011	1,36,834
2012	1,39,091
2013	1,37,423
2014	1, 41,526[3]
2015	1,80,000

16.2.3 Theft of Automobiles

The likely places for automobiles theft are public parking places, markets, university campuses, cinema-halls and other places of entertainment. The whole vehicle or only its parts may be stolen.

The motives for the thefts are varied:

1. **Joy ride;** the culprit(s) steal the vehicle, enjoy a ride and abandon it at a place convenient to them.
2. **Financial gains;** the stolen vehicle or its parts are sold. The 'business' is becoming an organised crime increasingly. The crime syndicate (gang) change the identification data (Registration number plates, engine/chassis numbers, paint/decorative item/ additional gadgets, etc.). Identification documents/insurance papers/pollution certificate/repair bills are all changed.

Fig. 16.4

The part bearing the serial number of a discarded vehicle welded on a stolen car after removing the original.

Theft of vehicles was not very common in India some years ago, except in some metropolitan and cities like Mumbai/Delhi. The crime is increasing at a fast rate.

3. **Committing other crime,** the vehicle is stolen sometimes to commit some other crime: smuggling/, illicit trade/robbery/murder. The vehicle is abandoned after the

3. WHO statistics for India, in 2014: 1). Total 'Road Accidents': 4,50,898; 2). Deaths: 207,551; 3). Persons injured: 4,77,731. NCRB's figures are: deaths 1,41, 526 and injured 4,77,731.

commission of the crime. Terrorists are using stolen vehicles to commit murders robberies and suicide bombing. Bombay blast of 1993 is a notorious glaring example of what destruction can be achieved by vehicular bombing.[4]

4. **Escape from the scene**; the vehicle may be stolen just to run away from the crime scene. The vehicle is abandoned as soon as the criminal feels that he is at a safe/distance/place.
5. **Crime vehicle**, Sometimes a vehicle is involved in some accident/crime. The owner fears prosecution. He therefore, lodges a false report of the theft of the vehicle.
6. **Insurance fraud,** the vehicle is insured heavily. The valuable parts are removed and the vehicle is destroyed or declared stolen. The insurance money is claimed.

The modus operandi of the theft of the vehicle is simple. The criminal opens the door of the vehicle with a master key. Or, he pushes down the glass window with a screwdriver. Alternatively, he forces open the door lock with a rod/pipe, used as a lever. He connects the ignition wires and drives away the vehicle,

16.3 THE PROBLEMS/POSSIBILITIES

Road accident investigations provide answers to many questions, including the following:

1. Is the reported accident genuine? Or, is it a ploy to conceal some other crime; or, is it to collect insurance money?
2. What is the identity of the "hit and run" vehicle?
3. Who was the driver; if the owner of the vehicle alleges theft of his vehicle?
4. Who is responsible (at fault) for the accident?
5. Is it a case of rash or negligent driving?
6. What was the speed of the involved vehicle(s)?
7. What is the available evidence to link the offending vehicle with the accident?

In automobile thefts, the following important questions need answers:

8. What is the original (true) identity of the suspected stolen vehicle?
9. Who is the thief?
10. Are the seized stolen parts of the alleged stolen vehicle?

When a vehicle is the crime scene; or, a crime has been committed with the vehicle, the following questions crop up:

11. Has the given crime committed in the alleged vehicle?
12. Has the culprit been linked with the vehicle and hence with the crime?
13. Can the victim be linked with the vehicle/culprit?
14. Has the sequence of events of the crime reconstructed? Reconstruction helps to verify the version of the accused or of the victim which is often necessary.

There is a variety of large variety of clues in road accidents. Their evaluations facilitate to understand various facets of crimes, including the following:

4. See chapter 14 on Explosives and Explosions.

16.3.1 Tyre Marks

The examination of tyres and tyre marks can answer the following questions:

1. Are the given marks left by a bus, a truck, a car, a motorcycle, a scooter, or a Tonga?
2. What is the make and model of the vehicle?
3. In which direction did the vehicle move?
4. Was driving normal? Or, was the driver intoxicated?
5. Did the driver apply brakes in time?
6. Are the given marks from the tyres of the given vehicle?
7. Was the tyre (tyres) not properly fitted to the vehicle?
8. Are the latent tyre marks from the suspect vehicle or from the given tyre?

16.3.2 Vehicle

1. Was the suspect vehicle at the scene?
2. Was the suspect vehicle involved in the given accident/crime?
3. Does the evidence on suspect vehicle sufficient, to link it with the crime?
4. Did the culprit use the vehicle to transport a dead body or other incriminating evidence?
5. Did the accident occur due to tyre burst?
6. Was there any mechanical failure of the vehicle?

Fig. 16.5

Tyre burst identifiable from irregular tearing, often fibres are protruding (as in this case). Simulated burst carry clean cut edges and indicate fraud

Fig. 16.6

The tyre burst faked, clear cut edges indicate the fraud

16.4 EVIDENTIARY CLUES

In the investigation of crimes, physical clues provide very important evidence to identify the culprit, and to link him with the crime/victim/scene/vehicle, etc. It is particularly so in road accidents and other crimes. They should be carefully located/collected/preserved/documented and got evaluated. The culprit, the victim, the vehicle and the scene exchange *inter se*. Road accidents fully demonstrate the validity of Locard's principle of exchange

'In Contact, traces are exchanged mutually'.

The following are the sources of important clues:

16.4.1 The Vehicle(s)

In '**hit and run'** case, the vehicle will carry traces from the scene of occurrence, from the object (vehicle) involved and the victim. The important clues on the vehicles are:

1. Fingerprints, palm prints, footprints, tool-marks and fabric prints.
2. Hairs, fibres, bloodstain or skin pieces from the victim
3. Small broken parts or fragments of the vehicle or of the article(s) hit.
4. Imprint of decorative pieces removed
5. Broken glass, paint, greases and lubricants from the victim's vehicle and control samples from the suspected vehicle for similar articles to those left at the scene.
6. Dust, mud and dirt from the scene of occurrence, from the victim or from the driver
7. Cigarette and '*Bidi*' ends, the culprit left in the vehicle. They can link the smoker with the vehicle with the driver, if he has absconded after the commission of the crime.
8. Mechanical fault(s) in the vehicle
9. Presence of new paint/registration number/numbers plate/change or mutilation of the engine and chassis number indicates the culprit's attempt, to conceal the identity of the vehicle.

10. Dent, scratches, holes and other damage to the vehicle
11. Temperature of water can fix the time if the vehicle is found at the site or nearby soon after it has been abandoned. Or, it can refute the defence that the vehicle has not been driven for hours or days.

16.4.2 The Scene

The scene of an accident usually carries the following evidence:

1. **Track marks;** they impressions or the prints of the four wheels are found either at the sharp turns or where the vehicle has been reversed.
2. **Skid marks;** they are found if the brakes have been applied suddenly and with force.
3. **Broken parts of the vehicle**
4. **Glass pieces**
5. **Paint streaks; smears or flakes**
6. **Greases and lubricants**
7. **Dust or dirt;** caked or otherwise, fallen from the suspect vehicle at the time of impact
8. **Fallen articles;** personal or parts of the vehicle
9. **Drag marks;** of the loaded material (*e.g.,* logs of wood, iron bars).
10. **Odour;** the load (petroleum products!) on a vehicle may leave a characteristic smell on the way through which it has moved.

16.4.3 The Culprit/Victim

In addition to dust, dirt, paint, glass pieces, greases and lubricants and tyre marks on clothes and body from the offending vehicle, the victim carries the following important clues:

1. Injuries

Fig. 16.7

The shape and positions of the injuries help to identify a run away vehicle in a hit and run case

2. Blood, fibres, hair and skin for control samples
3. Intoxicant (alcohol, narcotics) in the body, if the victim was intoxicated
4. Signs of disease (from post-mortem report); it may have contributed towards the death of the victim.

16.5 COLLECTION

The collection of evidentiary clues from the suspect vehicle, the scene of occurrence and from the victim needs immediate action, care and planning. Otherwise, the evidence may get lost. The suspect gets the vehicle repaired and repainted. The scene of occurrence is trampled over by the traffic and the victim is cremated or buried.

In the systematic collection of the evidence, one should:

1. Videograph, photograph and sketch the scene at the earliest, before removing anything from the place. The videograph, photographs and the sketches must establish the location of the scene and the objects at the scene *vis-a-vis* some prominent landmark at the scene. The Videography is ideal for the later appreciation of the scene of occurrence, by all concerned.
2. Before towing away the vehicle, carry out the following drill:
   - Note down the odometer reading at the scene itself.
   - Record the temperature at the temperature dial.
   - Ascertain the temperature of the atmosphere and the water in the radiator.
   - Ascertain the quantity of fuel in the vehicle.
   - Examine the area underneath and around the vehicle for any physical clues.
   - Remove and collect any loose evidence that is likely to get lost in transit.
3. Put a clamp on the steering wheel and take the vehicle to the nearest sheltered place, preferably with an arrangement to hoist the vehicle to permit examination of the underneath surface.
4. Record the discovery of any evidence, collect it and pack it properly in glass or cellophane containers depending upon the nature of the evidence.
5. Photograph (to scale) the evidence which cannot be seized and moved.
6. Observe the following precautions while developing finger and palm prints on the vehicle:
   - The vehicle is completely dry and at normal temperature.
   - The vehicle is not exposed to rain or wind, if possible.
   - Use aluminium and lycopodium powder mixture on non-greasy surface of a vehicle (steering wheel, mirror, side windowpanes, instrument panel, glove compartment, doors and door handles, etc.
   - Use white lead powder on greasy surfaces.
   - Establish the location, and identity of the lift. It is preferable to photograph the lift before removing the same. The lift itself is labelled. It contains information relating to the place of origin, the case in which it is lifted and the person who lifted it and the date on which it was collected.

- Remove and collect the loose evidence (fibres, glass pieces, paint flakes, dust, etc.) before starting the development of fingerprints.
- Whenever possible engage a fingerprint expert to develop fingerprints.

7. Prepare the casts of the plastic marks whenever possible.
8. Ascertain ownership of the vehicle.
9. Collect greases and lubricants found at the scene of occurrence. If they are found absorbed in the material, cut the absorbent material in the form of a cone. Collect a control sample of the material from the nearest point.
10. Collect liquid or semi-solid material on clean white cloth piece/filter paper or in a clean vial, with a dropper.
11. The victim may carry tyre marks. Collect the marks through photographs.
12. Get the victim medically examined, if he is injured. Collect the medico-legal/post-mortem report as the case may be. The evidence helps to decide whether injuries on the victim or damage to the vehicle are consistent with the version of the victim, of the culprit of the witnesses. Or, whether they are inconsistent *inter se*.
13. Find out if the culprit/are drunk or drug intoxicated.
14. Collect the skid marks.

Fig. 16.8

Head Injuries are the major cause of death in road accidents. The records of a hospital reveal that 95% deaths in accident cases are due to skull fractures and brain damage

16.6 EVALUATION

Motor vehicles accidents/crimes produce varied types of clues like fingerprints, track and other marks, broken parts of machinery, bloodstains, fibres, hairs, alcohol, glass, paint, soil including dust and debris, greases and lubricants, cigarette and '**bidi**' ends, etc. They have been discussed elsewhere in the book. Important vehicle specific clues have been discussed below:

16.6.1 Tyre

Tyres are important clues in crimes involving vehicles. They help to:

1. Link the vehicle and hence the culprit with the accident/crime.
2. Link the vehicle with the scene if rubber residue is left at the scene. It is available in skid marks almost invariably.
3. Fix the presence of the vehicle at the scene through dust, dirt and other traces the vehicle picks up at the scene.
4. Track the route/movement of the vehicle (presence of dust/dirt from the route!).
5. Reconstruct the occurrence (accident/crime).

   In a road accident, it was claimed that the accident took place due to tyre burst. When the deflated tyre was examined in the laboratory, radial cuts were found on both the tyre and the tube. The tube, surprisingly, contained a wooden piece about 5 X 4.5 X 2 cm. There were three possibilities:

   a. *The wooden piece had entered the tube at the time of manufacture.*
   b. *It could come in between the tyre and the tube at the time of tube change and enter the tube on its bursting.*
   c. *It could enter the tube at the time of the accident.*

   The first possibility was ruled out by a visit to the manufacturer of the tube, the second possibility was found improbable as there was no corresponding impression on the inside of the tyre. The third possibility was confirmed. The wooden piece fitted with a corresponding wooden piece from the hedge where the accident took place. (CH)
6. The suspected tyres are used to get test skid marks to help detection of over-speeding.

16.6.2 Tyre Marks

The tyre marks may be prints or impressions. They are found at the scene of occurrence, on the routes, at the parking places, at the hiding places (if any) and at the sites of disposal of incriminating evidence. The marks are clearly imprinted on soft soil, on the surface covered with a thin layer of powdery material and on wet earth. They are also well imprinted when the tyre is smeared with a liquid or a powder and the trodden surface is congenial to register the marks. Ordinarily, the marks of the front tyres are superimposed by the marks of the rear tyres, but if the vehicle is reversed, all the tyres of a vehicle leave their marks. The vehicles therefore, leave marks from all the tyres at the parking/reversing sites or at the sharp turning site.

The tyres and tyre marks help the criminal investigation in many ways, including:

1. Identify the vehicles in hit-and-run cases.
2. Indicate the culprit's mode of arrival/departure from the scene.
3. Identify the vehicle used for the removal or the disposal of the booty or the incriminating evidence.

4. Trail the criminals in vehicles to their hideouts, if the culprit takes an unfrequented route.
5. Indicate the disposal site of the incriminating evidence (if it was carried in a vehicle to a pond, river, etc.

The identifications/evaluations of tyre/tyre marks including skid marks are the most important evaluations. They permit determination of the speed of the vehicle, in hit-and-run or accident cases, the identification of the tyres; the evaluation of tyre bursts identify the route followed by the crime vehicles through the traces picked by the tyres from the route.

Identification of tyre marks vis-à-vis a tyre is based upon the following:

16.6.2.1 Tyre Width

The tyre width is the distance between the two edges of the tyre. The measurement of the width of the tyre or its clear mark offers no particular difficulty. The size varies for scooters, cars, buses and other types of vehicle used. It also varies with the type of the tyre; *e.g.*, radial tyres have greater width.

16.6.2.2 Tyre Circumference

The circumference of a tyre is an important parameter to determine the tyre size to type the vehicle. It is often difficult to determine from the marks. However, if the tyre imprints some conspicuous mark, the distance between the two consecutive imprints gives the circumference. Likewise, foreign object, wear and tear, manufacturing defect, legend or other peculiarity, imprinting its mark repeatedly help the determination of the circumference.

16.6.2.3 Tread Pattern

Tread patterns are often distinct. They help to identify the make. They vary with the maker; and also with the types/size. However, the following points are noteworthy:

1. Some small manufacturers imitate the design of well-known/respected firms.
2. Retreaded tyres may or may not carry the same design. Usually, they do not. They carry imitations of the design of respected brands.
3. The wear and tear may partially obliterate the design. The visible design, thus, may be confused with some other design.
4. Incomplete marks may mislead!

In some cases where the tyres are original, *i.e.*, fitted for the first time on the vehicle, the marks may lead to the manufacturer. Variations in tyre patterns of the various tyres, fitted on to a vehicle *inter se* will lead to the identification of the suspect vehicle.

16.6.2.4 Wear and Tear

Wear and tear in a tyre is unique. No two tyres, even of the make and fitted to the same vehicle, would suffer dissimilar wear and tear. This is so because the surface, with which they come in contact, the angle at which they meet the surfaces and the weight or pressure under which they meet are never alike. Further, wear due to misalignment, load in front or rear part, cornering (in heavy cars), sophisticated suspension system, over inflation or under inflation etc. wear the tyres/patterns differently and confer individuality. Peculiar driving habits also affect the wear patterns. Consequently, the wear and tear in any two tyres is never alike. When their patterns are available, they identify the suspect vehicle.

Fig. 16.9

The worn-out tyres carry many peculiarities. some of these may be transferred to the surface on which it moves. It may link the vehicle with the scene

16.6.2.5 Adventitious Peculiarities

Adventitious peculiarities are those, which are unintended, unexpected and unwanted. They include:

- **Mould defects**
- **Tyre damage**; cuts, clipping, chipping, tear and the like tend to facilitate the tyre identification
- **Embedded extraneous material**; like stone/metal pieces/glass pieces/wooden pieces, during use, get trapped in the tread of the tyre. Their marks often help to identify the tyre.

  The individuality of the tyre marks and their linkage to the original source are established easily if the adventitious entity is of some dimensions. In actual cases, adventitious evidence is rare.
- **Repairs**; they create individualising features.

Fig. 16.10

Adventitious change on the tyre includes inclusion of stone pieces, etc. in the tread pattern. The mark left by such pieces help to identify the tyre and consequently the vehicle

16.6.2.6 Crab-track Vehicle

The inter-distances between the front and the rear tyres in some vehicles vary. Such vehicles are called crab-track vehicles. The differences are usually peculiar to the make and model and provide useful information to identify the vehicle. The standard data is obtained from the manufacturers' catalogues or through reference to the manufacturer/dealer.

16.6.2.7 Wheelbase Difference

Vehicles, made by different manufacturers, in their different models, have different wheelbases,[5] which are useful guide to identify the make and model of the vehicle. However, it is difficult to determine the wheelbase from the marks of the wheels. When the vehicle is, parked for some time and there is some evidence of the original positions of the tyres, , the distance between the positions of the front and rear tyres give the wheelbase.

16.6.2.8 Turning Arc

An arc described by a vehicle while taking a turn, or at sharp turns, depends upon the size of the vehicle. The arc gives a good idea about the type of vehicle. A small arc indicates a small vehicle and a large arc points to a big vehicle. However, the manufacturer continues to reduce turning arcs. One studies the turning arc data about the vehicle before predicting the type of the vehicle. It is estimated when the vehicle has taken a 'U' turn (~180°).

16.6.2.9 Side Prints of the Tyres[6]

The sides of tyres carry legends, which identify the make, model and size of the tyre. Their registration at the scene or elsewhere is extremely rare. The presence of legend simplifies the identification of the make, model and the dimensions of the tyre. The information, in turn, indicates the type of vehicle used. If, however, legend from all the tyres is available (rarest of the rare cases), it facilitate considerably the identification of the suspect vehicle.

16.6.2.10 The Position of the Tyres Inter se

The direction of a tyre is ascertained from the earth, which is thrown in a characteristic way. The position of the stationary vehicle is ascertained from the drops of lubricating oil found below the engine.

If the vehicle has turned, the turning circle indicates the positions of the tyres. Front tyres make wider arc than the rear tyre. Tyres may be of one or more brands.

In a study on the subject, it was found that a fair percentage of new cars carried tyres of the same make. In many extensively used cars, tyres of different makes were found. The percentage of cars carrying tyres from two or three makes was substantial.

In India, no statistics has been collected. Besides, the retreated tyres on vehicles are quite common.

5. The distance between the front and rare axles is wheelbase.
6. The author has not seen such prints in his long service.

16.6.3 Skid Marks

Fig. 16.11

When brakes are applied to a vehicle, they lock the wheels and stop them from revolving. When the vehicle, with locked wheels, traverses a certain distance the vehicle is said to skid. The marks created by the skidding tyres are called skid marks.

The friction between the tyres and the surface abrades the tyres and black tyre material is deposited at the surface. The mark is conspicuous because of the black rubber residues, which makes the skid marks easily discernible and conspicuous.

When the vehicle is moving on soft earth, the sudden application of brakes ploughs through the earth. The skid marks in such cases are identified from the displacement of earth from the track.

When a vehicle is moving in dust or dirt, the skidding tyres removes the dirt from its path and creates the marks.

When the tyre is moving on a tarry road, it creates the marks in the tar, by pushing away the tar from its path.

Skid marks are created in loose or hard set snow, metalled, concrete or *kacha* road. The road may be wet or covered with mud, water, sleet, frost or oil.

Skid marks have great evidentiary value. They provide useful evidence.

1. The tread in the marks is clear to start with, because the wheels are not fully locked yet. They help to identify the source tyres.
2. They help to determine the speed of the vehicle.
3. The rubber residues deposited at the site is used to link site/skid marks to the tyre(s) source.
4. The tyres deposit fluorescent materials (anti-oxidants) wherever they are placed. About one minute's placement leaves sufficient residues to give a fluorescent outline of the tyres under ultraviolet rays, to permit their identification.

   In a case a boy was murdered while asleep. The culprit wrapped the body in the bedsheet, carried it in a mini station wagon of the victim's father and dumped the body at a refuse heap. The vehicle was set on fire. The investigation started with the discovery of the vehicle. It led to the house of the owner. Discovery of heavy blood staining there and the missing boy led the police to seek the help of the laboratory to trace the movement of the vehicle.

   A bloodstained axe and the boy's wallet were found where the suspect (a contractor) was constructing a building. Five garages had already been completed but none of them had been put to use. A thorough search of the garages revealed a small oil drop. Nothing else was visible on the floor. The experts, however, decided to examine the floor in ultraviolet light. The examination revealed four clear prints of the four tyres. It was possible for them to determine the possible make of the tyres, the front track width and rear track width. Comparison of the fluorescent prints at the site and those from the tyre, on the suspected vehicle tallied. All these observations placed the questioned vehicle in the garage. It provided a vital link in the chain of evidence to link the contractor with the murder. (CH)
5. The absence of skid marks in serious accidents indicates either a mechanical failure of the vehicle, (brake failure) or the failure of the driver who may be drunk, diseased, tired and dozed off. Or, the vehicle was used as weapon to kill. The absence of skid marks, thus, is very important in the reconstruction of the crime.

Many factors affect the length of the skid marks, including the following:

1. The speed of the vehicle
2. Weight of the vehicle
3. The condition of the road surface; rougher, the surface, shorter the skid marks.
4. Wet and greasy surfaces reduce friction; increasing the skid length.
5. Extraneous materials (mud, slush, water, snow, ice, sleet, frost, etc.) on the road, affect the skid length.
6. Condition of the tyres (over/under inflation, tread pattern, the extent of wear and tear of tyres) and their width affect the skid length.
7. Condition of the vehicle (mechanical efficiency of the engine/brakes/tyre fixture), etc. affect the skid length.
8. High temperature reduces friction; thereby increasing the skid length.
9. Reaction time is the time, which the driver takes to apply the brakes fully after he has perceived the necessity for braking. It varies with different individuals. Reaction time 0.5 to 0.8 second is normal. If a vehicle is moving at a speed of 60 km/h the distance travelled in reaction time is 8.

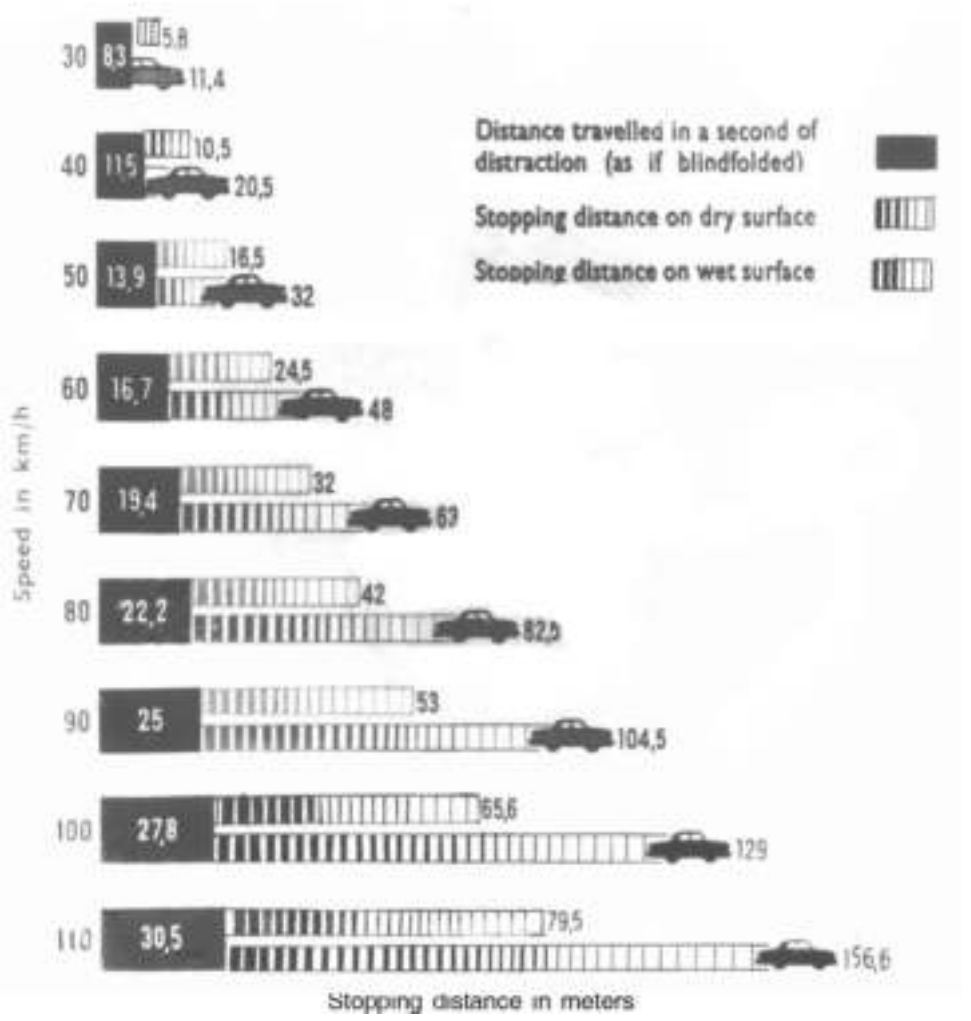

Fig. 16.12

The above diagram indicates the distances which the vehicle at various speeds travels before it stops after perceiving the necessity to stop. The distances in the black rectangle are roughly those distances which one traverses in reaction time, the time taken between sensing the necessity of braking and applying the brakes. as seen above wetness of the road makes appreciable difference

16.6.3.1 Speed Determination

Theoretically, it is quite easy to calculate the speed of the vehicle from skid marks. The kinetic energy of the vehicle is dissipated through friction and creates skid marks.

In calculating the speed of the vehicle, the experts make the following assumptions:

1. The skid mark is the result of the interplay of the vehicle (speed, weight, the efficiency of brakes, tyre conditions, etc.) and the friction of the road.

2. The vehicle is not obstructed by a vehicle/pedestrian/roadside tree, bolder, etc.
3. The vehicle is free from any mechanical defect, likely to affect the speed of the vehicle

16.6.3.2 Calculations

Let the mass of the vehicle be 'M' and its speed (= velocity) S'. Then, its kinetic energy (KE) is:

$$\mathbf{KE = 1/2\ MV^2 = 1/2\ MS^2 \ldots\ldots\ldots\ldots\ (1)}$$

Let **'f'** be the co-efficient of friction, 'L' is the length of skid marks and 'Mg' the weight of the vehicle. Then the friction energy ($\mathbf{E_f}$) is given by:

$$\mathbf{E_f = Mg\ x\ 'f'\ x\ 'L' \ldots\ldots\ldots\ (2)}$$

When the vehicle comes to stop, frictional energy, 'E_f' is equal to kinetic energy 'KE', *i.e.*

$$\mathbf{1/2\ MS^2 = Mg\ f\ L}$$
$$\mathbf{Or,\ S^2 = 2\ g\ f\ L;}$$
$$\mathbf{Or,\ S = \sqrt{2g\ f\ L}}$$

If we know the co-efficient of friction (f) and 'L', the length of skid mark (measured), 'g' is the gravitational constant, we can find out 'S', the speed of the vehicle. Now it is difficult to determine the co-efficient of friction accurately. It will vary from place to place, vehicle to vehicle and from time to time (weather conditions). Therefore, it is customary to determine the speed by creating test skid marks with the suspect vehicle at known speeds at the given site. With the experimental data, the unknown speed is determined.

If we denote crime scene speed and skid length as 'Sc' and 'Lc' respectively and corresponding test data as 'S_t' and 'L_t', we have:

$$\mathbf{'Sc' = 2\ g\ f\ L_c \ldots\ldots\ldots(3)}$$
$$\mathbf{'S_t' = 2g\ f\ L_t \ldots\ldots\ldots\ldots(4)}$$

Dividing (3) by (4), we get

$$\frac{\mathbf{'Sc'}}{\mathbf{'St'}} = \frac{\mathbf{'Lc'}}{\mathbf{'Lt'}}\ \mathbf{or,}$$

$$\mathbf{'Sc'} = \frac{\mathbf{'Lc'}}{\mathbf{'Lt'}}\ \mathbf{X\ 'St'}$$

If we know 'S_t', 'L_c' and 'L_t', questioned the speed of vehicle (S_c) can be determined.

In actual determinations, the expert observes the following precautions:

1. Skid marks from all the four tyres are measured. Average of the four skid marks is taken, whenever, possible.
2. Skid marks must be distinguished from ordinary tread marks. Mistaking the later for skid marks will give the wrong speed of the vehicle.

Co-efficient of friction consists of two components:

- Road-tyre interaction
- Mechanical efficiency of the engine and other parts of the vehicle

Co-efficient of friction for normal vehicle and for the metalled road is about 0.6 to 0.8 though it varies with road-vehicle conditions. Wet road reduces the co-efficient to 0.5 or less. Likewise, rise in atmospheric temperature or due to heavy load, the friction decreases..

Generally, the coefficient of friction is not measured. Instead, test skid marks, as given above are used to determine the speed. This method is more accurate and practical as it duplicates the accident conditions. Here the skid marks at the scene are measured individually, care being taken that the initiation point of the skid marks is correctly located. If $\mathbf{L_1, L_2, L_3}$ **and** $\mathbf{L_4}$ are the four measurements for the four tyres, the average LC is used as the length of crime skid mark:

$$\mathbf{Lc = \frac{L1+L2+L3+L4}{4}}$$

The test skid marks are created in the following situations:

- **Suspect vehicle is available;** Whenever suspect vehicle is available in working conditions, the same vehicle, load, road and road conditions should be used. Four test runs should be made. Average of the skid marks of the four runs is taken to ascertain test skid length.
- **Suspect vehicle is damaged;** vehicle of the same make and model, in similar wear condition is chosen. The tyres of the damaged vehicle are transferred to the test vehicle and test marks obtained as in (1) above. Skid marks, thus obtained/used for the speed calculations. The results are less accurate.

The vehicle is repaired sometimes to create test skid marks.

- **Suspect vehicle not available;** A vehicle of the same/model is used for test marks; obtained as in (1) above.
- **Gap in skid mark(s);** if the involved vehicle has bumped at the site or brakes have been released there will be a gap in skid marks. This gap in skid marks is not included in the total length of skid marks.
- **Test start point;** the starting point is fixed carefully to create test marks. It is best to prefix the point from where the brakes are applied. The skid marks at the start are faint. They are also taken into account.
- **Rear tyre skid marks;** they may overlap the front tyre skid marks. The lengths have to be ascertained carefully
- **Reaction time;** the distance travelled in reaction time, is part of the stopping distance. It varies even with the same individual at different times and different situations. It is difficult to correlate it with skid marks. It is, therefore, ignored.

The Accurate determination of the speed from skid marks is cumbersome. An approximate idea of the skid length/speed relationship of an ordinary Indian small car is obtained from the table given below:

Table 16.5

Skid Length Versus Speed

Skid length (metres)	5	10	20	30	40	50	60
Speed (km/h)	30	40	50	70	80	90	100

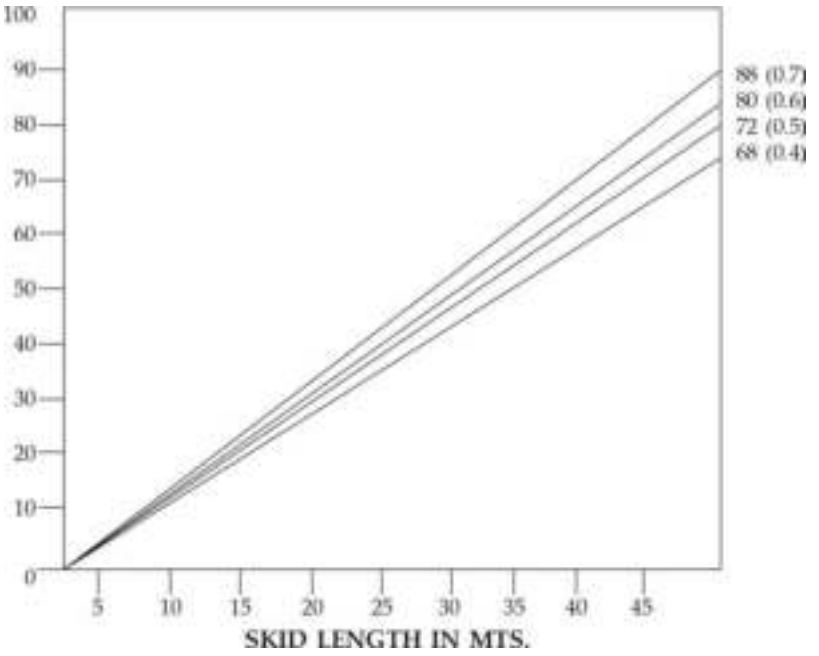

Fig. 16.13

Breech face marks, unusual pattern, sufficient to establish the common source

Table 16.6

Stopping Distance at 50 Kilometers Speed

S. No.	Road Surface	Co-efficient of Friction	Stopping Distance (metres)
1.	Dry concrete, dry asphaltic Concrete	0.8	11.3
2.	Dry bricks	0.7	13.1
3.	Wet asphaltic concrete	0.6	15.2
4.	Wet dry gravel/cinders, wet tar	0.5	18.3
5.	Wet concrete/bricks	0.4	23.9
6.	Packed snow	0.2	50 (?)

The above skid length-speed calculations are valid only when the vehicle comes to a stop of its own, without any obstruction. However, in most of the accidents the vehicle collides with other vehicle(s), some other object like tree, parapet or sidewall. Thus, the total momentum of

the vehicle is not used in the creation of skid marks. It is spent in damaging the other vehicle or the object hit. The energy lost in the impact is taken into consideration for correct speed determination of the vehicle.

Calculations become more complex if the other vehicle is also moving. Instead of sliding to a stop, our skidding vehicle ultimately collides with a vehicle (say, a bus), causing major damage to both the impacting vehicles. The obstructing vehicle impedes the sliding vehicle, changing the possible skid length as well its direction, which would otherwise have continued in its original direction of skid if the impact had not occurred. Longer skid marks would have resulted if no impact had occurred. Therefore, it is always erroneous to use the skid length alone to estimate the pre-impact speed.

In a collision, the vehicle's loss of kinetic energy, due to impact, is taken into account to get correct speed of vehicle.

16.6.4 Tyre Residues

Tyre residues are residues of the material abraded from the tyres, which contain many materials including antioxidants and extenders. They give a tyre pattern, tyre width, wheels base, etc. Thus, it is possible to identify the tyre and the vehicle with respect to its make, model and the individual vehicle in some cases from these residues.

The antioxidants leave fluorescent marks at the place of parking. The intensity of fluorescence varies directly with the time for which the tyres were in contact with the surface. The fluorescence fades with time and vanishes in due course.

The skidding tyre deposit residues in the skid marks. Only small quantities are required for analysis. The residue deposited even on a small piece of stone is often sufficient for analysis. The residue material is in such a way that interfering materials do not get scraped along. The IO sends the object itself when feasible. Otherwise, he scrapes the material from the surface and sends it to the departmental laboratory.

Fluorescence in tyre residues is due to the following substances:

1. **Antioxidant;** they are added to improve the keeping quality of the rubber. The fluorescence of their traces are characteristics of the material and provide substantial evidence.
2. **Extender oils**; they are important constituents added in large amounts to the composition of tyre materials. They facilitate the manufacturing process. Their fluorescence is used to identify/discriminate the tyre materials.

   The exact nature and quantities vary with different manufacturers. Fluorescence of the tyre residue is mostly due to these substances. Extensive variations exist in the fluorescence of the tyre residues. Both qualitative and quantitative analyses help in linking the tyres with its traces. Some of these substances fluoresce at 300-350 nm.
3. **Polynuclear aromatic hydrocarbons**; they are formed at high temperatures to which the tyre rubber is subjected in the manufacture and later due to friction. Wear of the tyre increases these compounds. They ordinarily exhibit fluorescence at 415 and 465 nm.

New tyres contain fewer amounts of polynuclear aromatic compounds. They show less intense fluorescence at the above wavelengths.

Spectrofluorometer and gas chromatograph are the main instruments used to study tyre residues.

The surface on which tyres leave residues plays an important part. The following facts about the surface effects are noteworthy:

- If the surface is metalled, the residue is contaminated with bitumen, which absorbs and masks the fluorescence from tyre residues.

  If the fluorescent materials of the residues are extracted, the bitumen components are also extracted and give far stronger fluorescence of their own, masking the fluorescence from tyre residues.
- The dirt, absorbent surfaces or the carbon in the tyre residues mask the fluorescence of the tyre residues.
- Fluorescent tyre prints are developed from their residues. 15% solution of polyvinyl acetate in ethyl acetate is one of the popular spray solutions to develop the prints.
- Polythene sheets or waxed paper is used to pick up tyre residues. They absorb the fluorescent components of the tyre materials and fluoresce under ultraviolet rays.

  Bricks and paved surfaces take the marks fairly well, provided the surface is not driven over too frequently and is not covered by materials, which give their own fluorescence. Thus, latent marks can be developed at parking places and garages with concrete surfaces, which, are not in constant use.

The tyre residues, as evidence, have a great future. They are likely to provide useful evidence to solve serious crimes in the coming times.

16.6.5 Tyre Bursts

Tyre burst is one of the commonest excuses given for accidents. Tyre bursts are easily identified from tears on the tubes. Sometimes the tears may be on the tyre also. In explosive tyre bursts, part of the tube is separated from the tube and the tear is characteristic in shape. In normal deflation due to puncture or cut caused by nail, glass, metal piece, stone or even piece of wood, the characteristic tear pattern is absent; the tube also does not blow off.

Intentional deflation to show burst is often crude. It consists of one or two regular tears or cuts. They are easily identified.

Tyre burst is distinguished from tyre failures. The latter are concussions (compaction on impact), towing damage (especially when tyres are deflated), dislodgment damage, head breaking, aquaplaning (incorrect metal wire in the tyre rim), damage due to tyre fitment etc. Besides, the vehicle failure due to mechanical defect may cause an accident. These points need careful evaluation *vis-a-vis* tyre burst.

In a tyre burst investigation, the investigating officer should send:

1. The whole wheel unit: tyres, tube, flap and wheel-rim
2. Detailed information on how the accident occurred including the angle of impact, speed of the vehicle (if possible), load, surface conditions, weather, etc.
3. Videograph of the scene/vehicle
4. Photographs of the scene of occurrence, including those of damage
5. Copy of the site plan

It will promote justice if the expert is called to the scene.

16.6.6 Mechanical Failure

Mechanical failure sometimes causes an accident. A vehicle mechanic, engineer or a vehicle inspector can help to locate the cause of the failure. He will be able to ascertain the general

condition of the vehicle and the mechanical defects, if any, which cause the accident. He furnishes a detailed written report after the examination.

Fig. 16.14

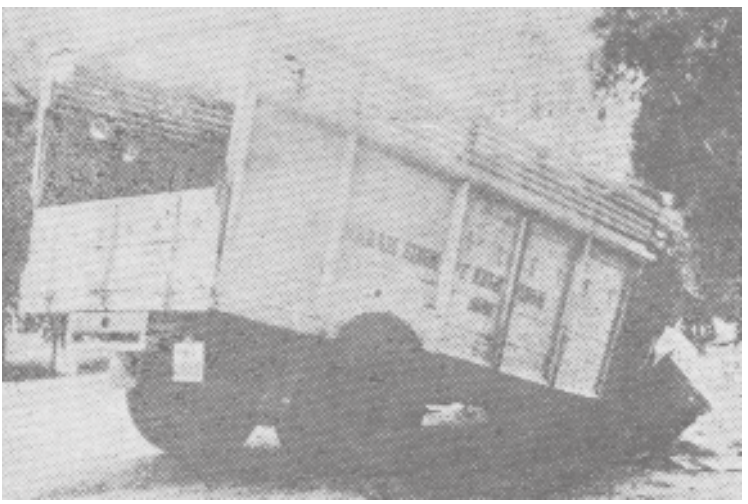

Fig. 16.15

The positions of the vehicle, extent of damage and the site of damage help to establish theguilt of a particular vehicle involved in the crime. in the above road accident involving abus and the truck (Fig. 16.10), (Fig. 16.11); the position of the vehicle as well as the siteand extent of damage clearly indicated that the truck (fig. 16.11) was at default

16.6.7 Leftover Objects

The culprit may leave tools, articles of clothing and other personal belongings in the vehicle or at the scene of occurrence. In addition, broken parts from the vehicle are also left at the scene. They provide a link between the crime and the criminal. The following points prove useful:

1. The source of origin of the article may lead to the owner who may be the culprit or his companion.
2. Articles of clothing may carry tailor or laundry marks. They may carry letters and other items, which may reveal the identity of the owner culprit or his co-travellers.
3. Handkerchief may have saliva, nasal secretions and other body fluid stains, which may permit blood grouping.
4. The leftover article may have a smooth surface and, if the culprit had handled it, it may carry fingerprints.

16.7 RESUSCITATION OF VEHICLE NUMBERS

If a motor vehicle is stolen, the thief tries to change the original serial numbers on the engine and chassis, etc., by filing, hammering or chiselling. He changes the original digits and designs. He also changes the registration number on the plate. Sometimes instead of using a fresh registration number plate, the fictitious number is painted over the previous numbers after covering the first with a thick coat of paint. The change in numbers is deciphered through resuscitation. The painted over number is found by removing the paint.

The resuscitation of erased punched number is based upon the principle that the punching increases the concentration of the metal molecules underneath the punched number. This increased concentration of metal help to resuscitate the original number in the following ways:

1. The surface is cleaned, polished and etchants (usually mineral acids, suitably modified for various types of surfaces) are applied. The difference in reaction rate at the punched surface and the rest of the surface makes the original number visible.
2. Radiograph sometimes reveals the number.
3. The metal is placed in a magnetic field and iron filings, suspended in a liquid base, are spread over the surface. The digits and letters are formed by the arrangement of the iron particles on the edges of the punched writings.
4. Electrolytic dissolutions or depositions also help to resuscitate the number.
5. If the number is engraved with chisel and hammer, engraving may compress the metal somewhat and permit resuscitation. If an electric engraver is used for engraving, resuscitation may not be possible. Enlarged photographs of the engraved marks after polishing, cleaning and removing paint and dirt may reveal the original number in some cases.

Fig. 16.16

Registration number as seen before and after processing

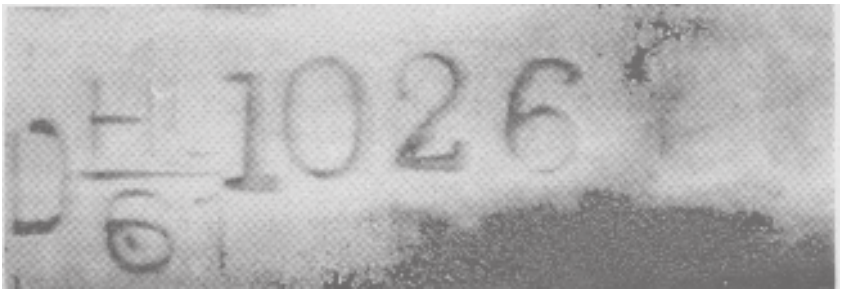

Fig. 16.17

Breech face marks, unusual pattern, sufficient to establish the common source

Fig. 16.18

Filling of the serial number of vehicles from the metallic surfaces is common in stolen vehicles. Fig. 16.13 indicates the filed number and Fig. 16.14 indicates the resuscitated number, by chemical etching

Mantra for Accident Prevention

1. Avoid excess speed. It is single biggest cause in road accident deaths.
2. Avoid driving after drinking. In 50 % of fatal accidents, in USA, drivers were drunk/intoxicated
3. Avoid using mobile while driving
4. Avoid driving when tired.
5. Always take a break on long driving.
6. Avoid hasty/unnecessary lane change. Observe lane change discipline.
7. Avoid tailgating. Avoid getting close to the vehicle in front.
8. Avoid pushing ahead of the queue.
9. Avoid misuse of horn.
10. Maintain the vehicle in top-driving conditions.
11. Use dippers at night.
12. Observe traffic rules. Obey traffic signs.
13. Remember there are numerous irresponsible drivers (speed maniacs/rash drivers/ thrill hunters/intoxicated/inexperienced). Eternal vigilance against them is the word while driving.
14. Cater for the pedestrian who may be mentally deficient//intoxicated/old and the like.
15. Avoid the man in hurry crossing the road or overtaking to bypass your vehicle.
16. Drive slowly in congested areas.
17. Avoid speeding while going down the hill.
18. Never leave you side (lane) on sharp turnings on hill roads.
19. **Drive according to road conditions**
20. Follow speed limits
21. Ignore aggressive drivers.
22. Don't change CD's/pen drive while driving.

16.8 VEHICLE THEFTS

16.8.1 General

Vehicle thefts are common. The following table indicates the extent of the problem in India for the years **2010** to **2013**

Table 16.7

Vehicle theft in India

S.No	year	Vehicle thefts
1	2010	147,475
2	2011	151,000
3	2012	154,000
4	2013	165,000

Thieves steal them for varied reasons/purposes, including the following:

16.8.1.1 Joyride

The misguided youths steal vehicles for joyrides. They abandon the vehicle after the abuse, wherever they find it convenient. Often the vehicle is recovered intact unless it met with a road accident during the joyride.

16.8.1.2 Escape

Criminals cornered in a locality often pick up any available vehicle and run away. They abandon the vehicle where they find it safe to do so. Often the vehicle is undamaged unless it was damaged during the flight.

16.8.1.3 Commission of Crime

Some criminals find it convenient to use stolen vehicle to commit a crime like smuggling/ robbery/murder, theft, etc. They abandon the vehicle after the abuse. They thus, escape apprehension in some cases.

The thieves abuse the stolen vehicles to carry dead bodies, injured culprit(s) or booty. They are being used increasingly for kidnapping/abduction/rape. They often burn the stolen vehicle abused to carry dead bodies/rape-murders, along with the bodies or other incriminating evidence, to destroy all linking evidence.

16.8.1.4 Economic Gains

Most of the vehicles are stolen for clandestine sale. The culprit changes the identity of the vehicle before selling. Sometimes the thief disassembles the vehicle into parts and sells the parts.

In a recent case, police officials from Punjab and UT Chandigarh formed a gang to steal vehicles. They sold them after changing their chassis and engine numbers and forging their registration and other documents through computer and scanner. Modus Operandi was well organised. The work was divided to 'specialists' groups:

- *One group stole the vehicle.*
- *The Second group would bring in the essential changes in the identity of the vehicle and prepare/forged legally required documents.*

- *The third group would sell the vehicle in distant cities/towns.*

  The 'profits' were thereafter divided among the members of the gang.

  *When the law caught up with them, they were found to be in possession of eight vehicles. How many they had already sold, was not fully disclosed. (**CH**)*

16.8.1.5 False Theft Reports

Some owners, involved in some serious accident (or crime), lodge false report of the theft of their vehicle to escape from the responsibility of the accident or crime. False theft reports are also made by some unscrupulous persons to collect insurance money.

In U.S.A. in an old survey, the disposal of one million vehicles stolen in a year offers an interesting study:

- *About 55 percent were resold as such.*
- *About 10 percent were dismantled and parts sold.*
- *5 percent were used in the commission of a crime.*
- *The rest were used for joy rides.*
- *Automobile thieves form 30 % of the population of Federals jails of USA. **(CH)***

Automobile thefts are a big social, economical and law and order problem in USA. A similar picture is emerging in India also. Every year the number of stolen vehicle is increasing. The worst part is that the figures of the traced stolen vehicle are dismal.

16.8.2 Vehicle Theft Prevention

The tracing and recovery of the stolen vehicle is a difficult task. Recent figures of untraced/unrecovered stolen car, in Chandigarh, are extremely dismissal. In 2017, 78 % of the stolen cars remained untraced/unrecovered! In 2018 in Delhi 44,158 vehicles were stolen against 39,084 in the previous year. While 6,751 auto lifters were arrested in 2018, cops could recover only 4,619 stolen vehicles. It appears that the professional thieves are at work. They induct one or more of the following changes after stealing the vehicles:

1. Replaces the registration plate
2. Changes the original engine/chassis number
3. Repaints the vehicle in a different colour
4. Moves the vehicle to a distant place/big city and sells it after changing its identity.
5. Dismantles the vehicle and sells the parts.

Vehicle/car theft prevention needs multi-pronged inputs from the following:

16.8.2.1 Owner's role

Owner plays a pivotal role in the prevention of vehicle theft. He must:

1. Use anti-theft devices: power supply interrupter; Fuel cut-off device; ignition column guard; steering wheel lock; alert sounding devices on forced entry.
2. Fit GPS auto-theft recovery gadget to a GPS navigation device is to locate the stolen car.
3. Registration number on hardly visible parts. It helps to identify the vehicle on recovery.

4. Park the car in well-lighted part of parking space, after locking it properly.
5. Do not leave important car papers in the car.
6. Scrutinise online sale websites selling used cars/spare/body parts if your car is stolen.

16.8.2.2 Police Role

Delhi police has issued a useful advisory (given below). It should be followed by all concerned:

1. Enhance police presence and patrolling.
2. Identify vulnerable areas based on crime patterns in the jurisdiction of each police station.
3. Target checking of youths on motor bikes.
4. Gather macro-intelligence (District police as well as specialised units on the operation of criminal gangs).
5. Ensure close surveillance on known-criminals.
6. Ensure no registrations of second hand vehicles; without NOC from the concerned authority. Request and check with State Transport Authority.

Car thefts crime is an organised 'trade' now; gangs of thieves carry it out efficiently. They give new 'changed' physical identity to the stolen vehicle and corresponding fake documents (Registration number, insurance, purchase receipt) pertaining to the new identity of the vehicle. The high mobility, anonymity in the cities and high expertise in changing the identity of the vehicle have made the tracing task of the police difficult. Population explosion and inter-state and inter-city gangs are making the task even more difficult. The vehicle may be stolen in Delhi and stripped into parts and sold in Mumbai. The communication gap[7], the geographical and the jurisdictional barriers help the car thieves.

An IO takes the following action:

Interviews the owner to collect the following information:

- Make, model, paint shade(s) of the vehicle
- Registration/identification/purchase document
- Collects genuine documents of the vehicle (Registration number, chassis/engine numbers with the year of purchase
- Photographs of the suspected vehicle
- Any accident marks
- Repair marks
- Any special identifying feature(s)
- Description of all peculiarities and oddities, which the owner can recall

7. Government of India has hosted a website—**"Vahan Samanavay"**—for coordination and consolidation of information about the stolen/recovered motor vehicles
The online Motor Vehicle Coordination system, "Vahan Samanvay" is designed for coordination of stolen and recovered motor vehicles. Police, Regional Transport Offices and Insurance Sector are the stakeholders of this system. A motor vehicle enquiry counter for the convenience of the public is operational at NCRB at New Delhi. Many State/UT police organizations are also operating motor vehicle enquiry counters in their respective States/UTs for the convenience of public. The online enquiry service is available for the general public.

Identifies a stolen vehicle from the following features:

- The thief uses a duplicate key or direct connection of the wires. A stolen vehicle normally does not have original keys. Or, he starts the vehicle by connecting the ignition wires directly.
- The thief changes the number plates or the number thereon. The following observations help to identify the change:
  a. Clean/brand new plates on an old vehicle indicate stolen vehicle.
  b. Dirty number plates with illegible registration number also indicate stolen vehicle.
  c. Altered/repainted number plates.
  d. The thief repaints the vehicle. Fresh paint used indicates a stolen vehicle.
- The culprit leaves tool marks, on doors due to forced opening, in the absence of key.

Identifies the thief through the following traits

- The thief is not familiar with the vehicle, he fumbles while starting the ignition.
- He is nervous in traffic jams.
- He does not stop at traffic lights, especially when there is no traffic officer.
- Document papers relating to the vehicle, if any, in the possession of the thief, are improper/fake.
- The thief is often a youngster.

Seizes the vehicle if the driver is not able to satisfy the investigating officer about its ownership

- He tows the vehicle to a forensic science laboratory. He does not drive.
- He checks/compares the owner's identifying data.
- He Searches for evidence like fingerprints, cigarette stubs, abandoned articles, etc.
- He shows the vehicle to the owner for identification purposes.
- He ascertains that the identification data is adequate/sufficient.
- He provides all relevant information to the laboratory to facilitate analysis; important numbers (Registration, Engine, Chassis, etc.).
- He gets the vehicle's documents verified from a document expert, including the seals and signatures of the registration and licensing authorities.

The automobile thefts are on the increase. They will increase further. The present investigative inputs are inadequate. An auto-thief is not a local/lone entity. He is often a part of an organised crime syndicate/gang.

Handling automobile thefts need a proper strategy. —**"Vahan Samanavay"** website of the government of India coordinates/consolidations information about the stolen/recovered motor vehicles. It is an important starting point. However its success depends upon the vigorous participation of the state police. All states must participate whole-heartedly and diligently to keep it updated and use it whenever a vehicle is stolen or recovered. It can be an efficient tool if all state police departments contribute sincerely to keep it updated.

Additional steps needed are:

1. Formation of Auto-Theft Investigation Teams at central and state level, with appropriate jurisdictional powers
2. Comprehensive information on vehicle thefts should be available to all investigating officers.

Identify theft-prone areas. Maintain increased effective police presence and covert surveillance on those areas.

Identify the disposal sites; where the stolen vehicles are disposed of before/after striping the vehicle. Covert surveillance of the suspected sites can be highly productive.

Watch the online Sale outlets for second hand vehicle and spare parts of the vehicles on daily basis for identifying the stolen vehicles or their parts.

16.8.3 Possibilities

Science and the scientific expert can find answer to the following questions, on stolen vehicles:

16.8.3.1 Is the seized vehicle stolen?

Whenever a criminal steals a vehicle, he changes registration, chassis, engine numbers and repaint the vehicle. The Forensic expert looks for and locates these changes. They indicate whether the vehicle is stolen or not. The genuine owner also can help to identify his vehicle or dents/damage or from other peculiarities which may have survived the depredation of the thief.

16.8.3.2 Who was its original owner?

The expert is often able to find the original registration, chassis and engine numbers on the vehicle. The correct numbers, identity the stolen vehicle, from the registration office or from the dealer. The police computers have also the record as given to them by the victim owners. Central government Website **Vahan Samanavay** should prove a boon in this respect.

Forensic document expert identifies the forged documents and their author, if the original documents have been altered or new fake documents have been created.

Vehicle registration offices are particularly useful for the purpose.

16.8.3.3 What is the make and model of the given vehicle?

It is comparatively easy to find out the make and model of the vehicle. Authentic information in this regard can be provided by the manufacturer/authorised dealer. Some laboratories keep catalogues of most of the vehicles currently available in the country. They can give the make and model of the vehicles.

16.8.3.4 Was the stolen vehicle used in the commission of the crime in hand?

Whenever a crime is committed in the vehicle or it is used as transport, contact traces are exchanged. The expert, on examination of these traces, indicates whether the vehicle in question was used for a particular crime or not.

16.8.3.5 Is the suspect linked with the theft of the vehicle?

Usually, the culprit and the vehicle come in close contact *inter se*. The culprit exchanges traces with the vehicle. The contact provides numerous evidentiary clues (fingerprints, hair, fibres, cigarette stubs, leftover articles, etc.). Likewise, fibres from the upholstery or carpet are found on the clothes of the thief. The exchanged clue materials link him with the vehicle in the majority of the cases.

16.8.3.6 Was the alleged crime committed in the suspect vehicle?

The person involved in the crime and the instrument of crime and the vehicle exchange traces *inter se*. It is therefore usually possible to say that a particular crime was committed or not. For example in cases of murder or rape-murder which are being committed in vehicles increasingly leave traces like blood, semen, saliva stains, hairs, fibres, etc. They not only indicate the commission of crime but also help to identify both the culprit and the victim.

16.8.3.7 Has the given part come from the suspect vehicle?

In most of the cases, it is possible to identify a broken part of the vehicle in respect of the vehicle from which it has come. However, in some cases a part (number plate!) is removed. The original contact may or may not leave identifiable traces. For example, a detached plate may have exchanged marks, dust, paint, to permit inter-linkage of the plate and the vehicle.

16.8.3.8 Is the driver driving the stolen vehicle?

The behaviour of a driver driving a stolen car can sometimes indicate that the driver is driving stolen vehicle:

- The driver usually becomes nervous/agitated on seeing a policeman/police vehicle.
- He is incoherent when questioned/interrogated.
- He tries to drive away the vehicle from the place where the police are checking the vehicles.
- He is unfamiliar with the vehicle and is uncertain in his driving.
- He and his companions wear sunglasses in the car.
- He or his companions may change dress while sitting in the closed stationary vehicle,

16.9 CASE LAW

16.9.1 Victim's Fault[8]

Author's Summary

A girl was going on a cycle. A bus going in the same direction crushed/killed the girl. The sessions' court convicted the driver. In the appeal, the High Court found that the driver was not driving rashly. Nor the motor mechanic found any defect in the vehicle. The court found that the girl suddenly turned towards right and was killed. It acquitted the driver.

Relevant Extracts (Verbatim)

Learned assistant government advocate argued that from the statement of P.W. 6, Guman Singh, it is proved that there was free travel pedal play of more than 1/2", indicating that the brakes of the vehicle were not in a perfect condition. He has stated that the handbrake of the bus was out of order as its linkages were disconnected. In the cross-examination, motor mechanic Guman Singh has stated that the free-play could result, even when the vehicle was in motion, and that in that event it would take hardly a fraction of a second to apply the brake. The witness has further pointed out that the hand brake in a heavy vehicle like a bus could not have been made use of at the time when it was in motion and that disconnection of the linkages

8. *State of Rajasthan v Hari Singh*, AIR 1969 Raj 86 : 1968 Raj LW 485 : 1969 Cr LJ 445 (Raj).

in the hand brake could also result when the vehicle was in motion. From the above evidence, it is not clear that there existed any material defect in the vehicle at the time when it was put on the road. The defect in the hand brake was of no consequence as such a brake, according to the expert, could not have been applied by the driver while the vehicle, was in motion. The defect of free-play according to the expert could possibly occur even when the vehicle was in motion.

When there was no rashness or negligence on the part of the bus driver, for having killed the girl, so far as the use of the road and the manner of driving the bus was concerned, the fact that the vehicle of the accused had free-play cannot be taken into consideration in convicting the accused under section 304 A, Indian Penal Code, though it can be made the subject of prosecution under the Motor Vehicles Act, when it is clear that the defect in question was not in any way responsible for the accident. I am fortified in my view by the case reported in *Emperor v Akbar Ali.*[9]

I further get support in this view from a Division Bench decision of this court reported in *State of Rajasthan v Chater Singh*.[10] In that case there was no evidence on the point that the accused knew of the defect. It was also not brought out that he had been driving the vehicle for a long time, so that knowledge of the defect could be imputed to him. If the defect was such that it could not be detected without meticulous examination of the machinery, it cannot be laid down that criminal liability could be fastened on the accused on that ground. In this case the defect was such that it could not be detected without a thorough examination of the machinery. It cannot be suggested that the accused Hari Singh should have undertaken such an examination before starting the vehicle. In that view of the matter also, no criminal responsibility can possibly be imputed to the accused.

It may also be stated here that from the evidence as pointed out above, it has not been found that the vehicle was being driven with rashness or negligence. On the other hand, there is the evidence to suggest that the bus was moving towards the extreme left side of the road. According to the prosecution, the girl turned towards the right side of the road. It is not clear how the girl suddenly turned towards the right side. When a person is run over by a bus and is crushed on the spot, the spectators are prejudiced against the driver of the vehicle and in such a case it becomes difficult for the court to ascertain the circumstances of the case. It is possible that the present mishap took place because the girl abruptly pedalled from the left side of the road towards its right, without knowing its consequences. The lorry stopped at a distance of about 7 ft. away from the place of the accident. In that circumstance, the accused cannot be held liable for the accident. Thus, circumstances of the accident being doubtful, the trial court rightly gave benefit of the doubt to the accused.

16.9.2 Mischief[11]

Author's Summary

A person was being taken away forcibly in a Jeep. The relative of the victim stood before the jeep to prevent kidnapping. The accused, however, did not bother and ran over the man. The person fell down and was dragged to a distance inflicting many injuries. The trial court convicted the accused for attempted murder. The High Court in their wisdom changed the charge of attempted murder to minor offence; in spite of numerous injuries and 45 days of hospitalisation and medico-legal opinion. Travesty of law!

9. AIR 1936 Oudh 400 : 37 Cr LJ 975; *Emperor v Akbar Ali*, (1933) Bom LR 1021.
10. ILR (1962) 12 Raj 103 : 1962 Raj LW 281.
11. *Marudevi Avva v State of Kerala*, AIR 1958 Ker 8 : ILR 1957 Ker 781 : 1958 Cr LJ 33 (Ker).

Relevant Extracts (verbatim)

The prosecution version is that while accused 1, aided by accused 3, forcibly made P.W. 12 get into the jeep notwithstanding the protests of P.W. 1, the latter stood in front of the jeep to prevent its moving and that at that time at the bidding of accused 1, accused 4 drove the jeep over him making him fall down and to be dragged along the road by the jeep for a short distance. The medical evidence clearly supports the case of the prosecution that P.W. 1 sustained several injuries as the result of the fall and the subsequent dragging by the jeep.

Ext. P. 6 is the wound certificate issued by P.W. 7 for the injuries he noticed on P.W. 1 when the latter was admitted to the headquarters hospital at Kozhikode as an in-patient during the night of the occurrence. There were as many as 15 injuries and Ext. P. 6 describes them as follows:

(1) An abrasion 1-1/2 x 1" over the front of right knee.

(2) An incised wound about 1-1/4" deep one inch above the right knee-cap.

(3) and (4) series of abrasions on the lateral aspect of the right leg and right thigh

(5) Three abrasions each about 1 x 1-1/2" along the lateral and anterior surface of the left knee.

(6) Minor abrasions 1/2" x 3/4" on the left thigh.

(7) An abrasion 5" long 2" wide over the lateral surface of right upper arm.

(8) An abrasion 2" long and 1" wide over the lateral surface of right elbow.

(9) Minor abrasion 1/2 x 3/4" over the posterior aspect of right elbow.

(10) Minor abrasion 3/4 x 3/4" over the tip of right middle finger.

(11) A contusion 1 x 1/2" over the lateral half of right eyebrow.

The question for us is whether these injuries were caused as alleged by the prosecution when the jeep ran over P.W. 1 and dragged him or was it a case of mere accident as suggested by the defence. The defence had a further case that, assuming the whole prosecution version that the jeep was allowed to run over P.W. 1 deliberately with the intention of killing him or with the knowledge that he would thereby meet with his death is accepted, they were protected from the consequence of their action by the right of private defence.

We shall now refer to the evidence of eyewitnesses as to how P.W. 1 happened to be injured. P.Ws. 1 to 5 have given consistent evidence that after P.W. 12 was forced into the jeep and all those who had that day gone over to Kootamunda estate in it, except accused 2, got into it, P.W. 1 stood in front of the jeep with a view to prevent its moving and that then accused 1 asked accused 4 to drive the vehicle over him and that the latter acted as ordered, with the result P.W. 1 fell down and was dragged for some distance by the jeep. The early records of the case already referred to (Exts. P1, P4, D2, and P2) lend support to this evidence. The nature of the injuries makes it unmistakably clear that P.W. 1 had fallen down and that the jeep had dragged him for a distance. We see no reason to doubt the truth of the prosecution evidence that accused 1 had bid the driver to let the vehicle move and the words attributed to her, set out more or less uniformly in the earlier records as also in the evidence given at the trial, clearly indicate that she wanted the driver to take the vehicle along regardless of the consequences. There is, however, more than one difficulty to believe that P.W. 1 was right in front of the jeep when accused 4 made the vehicle move as per the direction of accused 1. If P.W. 1 was right in front of the vehicle, probabilities are he would have sustained far more serious injuries. The height of the bottom of the engine from the ground level was only 1 foot 2 inches. The evidence that he fell on his back is more or less belied by the injuries noticed on the front part of the body particularly the knees. While we have no hesitation to think that accused 4 took a very rash step in allowing the vehicle to move while P.W. 1 was in such close proximity to it as

to get hurt by the motion, we cannot agree that accused 4 or even accused 1 ever intended to kill P.W. 1 or knew that he might sustain such injuries as would result in his death. Probably accused 1 thought the threat that the vehicle will be taken over his body would make.

P.W. 1 move away and accused 4 also must have thought likewise. The lower court itself would appear to have been in two minds as to whether the facts of the case warranted the conclusion it came to, namely, that by his act accused 4 intended to cause the death of P.W. 1 or that he knew that death would be the result of his action and whether accused 1 was instigating him to do that with such intention or knowledge. In paragraph 21 of its judgment in discussing the medical evidence the lower court observes:

> *.....The contention of the learned counsel for the defence is that P.W. 1 could not have fallen on his back in front of the jeep and caught up and dragged away by the jeep as alleged by the prosecution. They would contend that P.W. 1 was standing on a side of the jeep, that when the jeep was driven his clothe probably was caught up in the hooks and then he fell down on his right side and was dragged. P.W. 7 has stated in very clear terms that all these injuries could be caused by being knocked down by a jeep and dragged for some distance. In cross-examination he was asked whether the injuries could be caused by being knocked down by a jeep and dragged for some distance. In cross-examination he was asked whether the injuries could not be caused by P.W. 1 falling on his right side and then being dragged by reason of his clothe getting entangled in some portion of the jeep. He said that, that was also possible. "This only means that the injuries are consistent with the prosecution case and also consistent with the defence theory." The matter was further pursued in cross-examination and it was elicited that if a man falls on his back by a violent push the prominences on the back side will come into violent contact with the earth, that the back of head and buttocks are the two major prominences on the back side and that if the back of head comes into violent contact with the earth, necessarily an injury right on the back of the head can be caused. But then in re-examination he has stated that injury No. 14 is on the left side of head partly to the back of head also, that if in falling on the back the head is slightly tilted to a side there will not be any injury right on the back of the head and that if when the body is dragged by the jeep the body is turned slightly to the right the injuries will be mostly on the right side. "It will not be seen that the medical evidence is not inconsistent with the prosecution case regarding the manner in which P.W. 1 sustained the injuries." There is the consistent testimony of P.Ws. 1, 2, 3, 4 and 5...*

On the finding that the injuries are consistent with the prosecution case and also consistent with the defence theory, the learned judge should, in our opinion, have inclined to accept the defence suggestion. To our minds, had the occurrence taken place as alleged by the prosecution nothing short of the happening of a miracle would have allowed P.W. 1 to come out of the ordeal with only such injuries as he actually sustained. He must have been hanging on to the jeep from the side. That the jeep left suddenly is clear from the fact that accused 2 was not able to get into it before it left. We would, therefore, take the view that accused 4 drove the jeep at the bidding of accused 1 at a time when P.W. 1 was in such close proximity to the jeep as suggested by the defence and that accused 4 drove the jeep so rashly or negligently as to endanger the life of P.W. 1. Hurt was thereby caused to P.W. 1. Though he had to be kept treated in hospital as an in-patient for 45 days, P.W. 7 stated in his evidence that after 14 days P.W. 1 could have been discharged and that after the said period he was in a position to attend to his ordinary avocations in life. Such evidence from a medical witness is rather unusual but it is there. In the circumstances the criminal act of accused 4 would fall only under section 337, Penal Code, and not under section 338 as it naturally would have been as the result of the 45 days' stay in the hospital.

In all the circumstances of the case we consider it more prudent and safer to arrive at the above conclusion that the offence committed by accused 4 would only amount to the offence stated above and not under section 307, Indian Penal Code. We are certain in our minds that but for the instigation from accused 1 accused 4 would not have emboldened himself to take the rash step of driving the vehicle in such a way as to endanger the life of P.W. 1. She therefore abetted accused 4 to commit an offence under section 337, Penal Code. During the course of the argument we put it to the learned counsel for the defence whether in case we were to come to this finding that they would consider their clients to have been prejudiced by our convicting

them accordingly when they were not tried for these offences. Their reply was that we would be within the law in so doing and that in that event they could not complain of any prejudice to their clients. We feel the concession is perfectly right.

16.9.3 Accident Evaluation[12]

Author's Summary

The main causes of road accidents are rash and negligent driving, width and characteristics of the road, traffic density and tendency to overtake, often going to the wrong side. These factors caused the accident in this case. The trial court unfortunately could not appreciate the evidence and opined that the there was no rash driving ignoring the it had hit a vehicle on the other side, struck an electric pole ,then travelled another 45 feet and hit against the parapet wall and turned turtle showed that the car must have been travelling at an extremely high speed. The SC rejected the findings of the trial court.

Highlights italicised

Relevant Extracts (Verbatim)

The facts in the case speak eloquently about what should have happened. *The main criterion for deciding whether the driving which led to the accident was rash and negligent is not only the speed but the width of the road, the density of the traffic and the attempt, as in this case, to overtake the other vehicle resulting in going to the wrong side of the road and being responsible for the accident.*

Even if the accident took place in the twinkling of an eye it is not difficult for an eye witness to notice a car overtaking other vehicles and going to the wrong side of the road and hitting a vehicle travelling on that side of the road. The criterion adopted by the learned judge for assessing the evidence of P.Ws. 3 and 4 and rejecting it is thoroughly unjustifiable. There may be cases where it is difficult to be clear or specific in giving details as to the cause of the accident but this is not one such case. The reference by the learned judge about the slight damage to the electric post and the conclusion drawn there from that the car could not have been going at a high speed is not correct as we shall show later. His further observation, that the fact that the car travelled another 45 feet and hit against the parapet wall and turned turtle showed that the car must have been travelling at an extremely high speed but there is a little blue paint on the pole and a faint grey stain on the parapet wall is self-contradictory unless we are to infer that the learned judge implied that the one or the other is not true. He does not so hold.

> *There can be no doubt about the car having hit the electric post and the parapet wall. That and the fact of its overturning would establish the rash and negligent driving. A car driven normally and travelling behind a bus does not go to the opposite side of the road and hit an electric post and parapet wall and turn turtle. The car apparently stopped only because it turned turtle. It did not hit the electric post or the parapet wall full tilt, if it did it would have stopped at one of those points. We should remember that the collision with the scooter and pushing it back would have considerably reduced the speed of the car. Even so it travelled farther.*

The slight damage to the electric post and the parapet wall is because the car hit them sideways. Nobody has suggested that they were brought into existence for the purpose of this case. The car would probably not have stopped but for turning turtle and it should have been travelling quite fast before it could overturn as the learned judge himself realises.

> ***There is only one conclusion possible on the facts of this case and that is that the accused came over to the wrong side of the road and was responsible for the accident and that is clearly a rash and negligent act in the condition of the road and the condition of the traffic.***

12. *Shakila Khader v Nausher Gama*, AIR 1975 SC 1324 : (1975) 4 SCC 122 : 1975 Cr LJ 1105.

CHAPTER 17

MICROTRACES

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Edmond Locard on Trace Evidence

"Wherever he (culprit) steps, whatever he touches, whatever he leaves, even unconsciously, will serve as a silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibres from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects. All of these and more, bear mute witness against him. This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It is factual evidence. Physical evidence cannot be wrong, it cannot perjure itself, it cannot be wholly absent. Only human failure to find it, study and understand it, can diminish its value."

Fig. 17.1
Police dog on scent trail

17.1 NATURE

Microtrace in forensics is clue materials in small amounts, often in traces. They may have any physical or chemical entity. They may be organic or inorganic substances, plant materials or material from human or animal kingdom. They can be microorganisms, sub-life materials; they can be gases, liquids, or solids.

Micro traces are frequently found in crime situations, at crime scenes, with the victim, on the culprit, in the vehicle used in the crime or on the weapon used in all types of crimes such as homicides, rapes, assaults, burglaries, and automobile accidents or thefts.

All types of materials are encountered as micro traces in Forensics, including:

1. Plant Materials
2. Dust, debris
3. Fibres
4. Polymers
5. Minerals
6. Hair
7. Glass
8. Paint
9. Soil
10. Materials of animal origin
11. Gunshot Residue (GSR) on clothing and other items
12. Marks (prints and Impression)
13. Grass
14. Bloodstains, smears, droplets, washed blood, flakes, dry powder
15. Semen stains, smears, streaks
16. Skin
17. Marks: tool marks, fingerprints, foot/footwear marks, bite marks, puncture marks, holes, injuries
18. Plastic materials
19. Minerals
20. Odours, and
21. The list continues

Some of the traces form chapters or parts of the chapters in this book. Some others, which are being used increasingly in forensics, are discussed here.

17.1.1 Plant Materials

Wood, wood splinter, bark, twigs, starches, sawdust and shavings, leaves, flowers, petals, pollen, plant hairs, fibres, seeds. They are different from different species/sources.

17.1.2 Dust

Dust is a general name for all types of materials in extremely fine form, usually in mixture form of two or more entities. They are fine particles of flora, fauna, soil, minerals, and other

materials found at the place. Weather conditions affect the nature of the dust as it almost continuously changes the composition of the dust. They, in short, represent the environment and the various activities at the place. Dust vary from place to place.

17.1.3 Fibres

Fibres of all sorts—natural fibres, fibres from animals, human beings (hair!), plants and minerals, and synthetic fibres are found as micro traces. The number and variety of fibrous micro traces are increasing every day. They are an important part of the usual dust.

17.1.4 Polymers

The extensive all-round use of plastics, rubbers, elastomers and the like materials has inducted these materials into micro trace evidence. Tyre residues in skid marks provide important evidence to interlink the tyre (and hence the vehicle) with the accident. Wire covering material, in the theft of wires/cables, provides useful linking evidence.

Plastic containers and bags are frequently and increasingly being utilised for package for all sorts of materials, including drugs which the peddlers often ell in small pouches. Their analysis and comparison can often lead the IO to the distributors/packers. The analysis of plastic bags, containing drug, has been used in identifying the premises; and the persons who were the kingpin in the packing of the drugs in small pouches.

17.1.5 Minerals

Sand, soil, plaster particles, metallic dust, grit, naturally occurring oxides and other compounds, industrial products and waste, ores form part of some dust. Persons working/visiting quarries and mining sites pick up the special mining material dust. It helps to link the persons with the site. The professional dust, found on unidentified dead bodies, helps in their identification.

17.1.6 Glass

Glass is one of the commonest/most important micro traces in Forensics. It provides linking and reconstruction evidence in a variety of criminal cases; including:

1. Hit and Run cases
2. Road accidents
3. Burglaries and dacoities
4. Kidnapping
5. Rapes and murders
6. Drunkards' brawls
7. Vehicular insurance frauds.

There are many types of glass. The variety helps in their discrimination and thus, enhances the evidentiary value of the evidence.

17.1.7 Paint

The paint is used extensively for preservation and beautification of many articles in daily use. Painting of the interiors of the buildings and that of the vehicle is almost universal. Thus, in

the commission of the crime, the criminal and the victim may come in contact with paint and pick up smears, paint dust, tiny flakes. These traces link the criminal the crime and the victim *inter se.*

Further, the variety of paints is very large, which allow high discrimination of the paint source.

17.1.8 Soil

Soil is important evidence. There are infinite variations in the soil, especially in the topsoil due to varying flora and fauna, effect of sun, wind, rains, and the human and animal activities. Minerals, fragments of materials, organic matter, all confer individually. One forensic scientist has studied even the amino-acid variations in various soils for individualisation.

17.1.9 Materials of Animal Origin

The prominent materials are hair, tiny particles of skin, flesh, bones, and particles of dried blood or other body fluids. They may be as smears or solid or semi-solid residues, bone fragment, nail pieces, horn or feather fragments and their disintegrated products in the form of proteins, enzymes and amino-acids. They often figure in microtraces.

In addition to the above, other types of microtraces also come up now and then like grass, microorganisms, polymers, and insects.

17.2 IMPORTANCE

Microtraces as evidence have great importance, mainly for the following reasons:

1. **Microtraces are omnipresent**; they are always exchanged (Locard's Principle of Exchange). They are present in all crimes.
2. **They are inconspicuous**; they are usually very small. The culprits and/or his well-wishers often do not notice them. In fact, they are often unaware of their existence, location and their value. He, therefore, does not take the usual precautions to prevent their occurrence or destruction. They are, thus, available undisturbed/unmutilated and undestroyed most of the time. They provide useful evidence.
3. **The culprit knows and avoids macro incriminating evidence**; he is becoming more and more aware of the same. He does not leave such evidence at the crime scene, whenever possible. For example, fingerprints evidence was, once upon a time, the most respected and frequently available evidence. Its occurrence is now dwindling.
4. **The eyewitnesses' accounts**; they were the kingpin of the judicial proof. They are not only becoming rarer but are also becoming highly undependable and unreliable. Quite a few of them jump the fence for cash or kind; or, for fear of retaliation from the accused.
5. **Microtrace evidence has high evidentiary value;** this has become possible because of the tremendous progress the science and technology have made in recent years. It is now possible to link the tiniest clue material to its possible source of origin, with certainty.
6. **Microtraces can indicate the *corpus delicti*.**

   In the case of death of an elderly person, by drowning, it was given out that she drowned accidentally. The police, however, as a matter of routine, checked homicidal

angle also. The son-in-law with whom she was living was interviewed. He did not give satisfactory answers to various queries. One of the suspicious circumstances, found by the police, was the discovery of a mud stain on the trousers of the suspect. He informed the police that he picked up the stain from a street drain where he had slipped.

The police collected the mud sample from the site indicated by him and from the place where the dead body was found on the side of the lake. The three mud samples were sent to a microbiologist. He found that whereas the microbiological population of the mud stains on the trousers tallied with the one from the lakeside, it was completely different from that of the drain mud. The son-in-law, when confronted with the evidence, confessed to the crime. (CH)

7. **Microtraces help identification** of the culprit, of the victim, of the witnesses, of the various materials involved in the crime, of the *modus operandi* and reconstruction of the occurrence. The root of a hair, after comparison of its DNA profiles of the hair and of the suspect, can establish the identity (or non-identity) of the suspect as the culprit.
8. **Microtraces can link/de-link suspect** with the crime. For example, a bite mark on the breast of the victim was the only evidence on which the suspect was convicted of murder[1]. It was perhaps the first case in which the conviction was based on bite marks (Odontology!) only.
9. **Microtraces permit verification of versions** of the given event.

   Some years ago, a young girl was found murdered and stuffed in a gunny bag, left under the staircase of a multi-flat multi-storied building. The girl had been seen in the company of a wandering tribe of gypsies. The police suspected that a member of the tribe must have killed her after rape, as they noticed blood coming out from her vagina. The post-mortem examination, however, revealed that the girl had not been raped but her vagina had been mechanically interfered with. The police continued, for some time to check the members of the gypsy tribe. However, they failed to link the murder with the gypsies.

   The police then concentrated on the residents of the building. Ultimately they came to suspect one old lady living all alone in a flat of the building complex. It was learnt that the girl used to tease the old woman and who in turn would abuse her.

   The doctor, who had carried out the post-mortem, had found that the vagina of the victim had inflammation, which should not have been there unless the instrument (rod) used for interference carried microorganisms. He preserved the microorganism. The police searched for a possible instrument at the woman's flat, which could create the wound and inflammation. They located a rod used by the woman to clean the kitchen drain hole. The microbiologist found that the vaginal microorganism had come from that rod which had been used by the woman to ward off suspicion from her, to make it the crime look like a sex crime. When confronted with the evidence, the woman admitted her crime. (CH)

10. **Microtraces provide leads** to help the IO in the investigation of crime.

    In a classic case of the use of Microtraces, the expert led the police to the culprit from a length of string which had been utilised as an initiator to explode a heavy charge of explosive kept near the window of the intended victim, who had been sleeping near the window. One end of the string was embedded in the charge, the other was smouldering and the smouldering end was advancing towards the charge. Fortunately, the intended

1. Biggar murder case took place in Scotland in 1967. The victim was a teen-age girl, Lind Peacock and the murderer was Gordon Hay, also a teen ager.

victim woke up, sensed burning and at once extinguished the burning string. The expert who examined the string gave the following information:

- *The string had come from an agricultural farm.*
- *The location of the farm is by the side of a fast flowing stream.*
- *There are white and brown horses at the farm.*
- *There are red chickens at the farm.*

The farm could be located. The culprit was apprehended. (CH)

11. **Microtraces fix the identity of the scene**.

In a case of rape, the suspect denied both the offence and the visit to the alleged scene. The clothes of both the culprit and the victim were examined. Certain seeds were found on the clothes of both. Checking at the scene indicated that the seeds had come from an uncommon weed, which was found at the scene. (CH)

12. **Microtraces help to reconstruct the occurrence**, the sequence of various events and the *modus operandi*. Microtraces have one great drawback, which has prevented its exploitation as evidence. Its utility remains unknown until it has been evaluated in the laboratory. Consequently, the investigating officer remains groping in the dark. Often he feels the exercise is not worth the trouble. However, in the coming times, in view of the dwindling utility of traditional evidence, he has to depend upon increasingly on the microtraces to provide convincing evidence against the culprit.
13. **Microtraces help in other ways:**
    - Promote real confessions
    - Help to identify unknown dead bodies through professional dust and other traces found on them.

I am an Investigating Officer

1. I arrange medical facilities to the injured at the crime scene to save life.
2. I protect and preserve the crime scene.
3. I assess the scene and requisition the needed expert help.
4. I fix the scene site, evidential sites and the evidence through. Videography/photography/sketches/textual notes.
5. I locate, collect, pack, and seal microtraces and other evidence from relevant sources: the scene, the victim, the culprit, the vehicle, used the residence/office of the culprit.
6. I pick the leftovers and the residuals of the picks.
7. I send the microtraces to departmental FSL, with all legal formalities.
8. I maintain their identity/integrity/authenticity/relevancy and Keep the chain of their custody intact.
9. I interlink the leftover, the picks, the culprit, the Crime Scene, the weapon, the vehicle and the victim *inter se.*

10. I ascertain the *Modus Operandi*.
11. I check the sequence and verify the versions.
12. I find and handle the victim/criminal/witnesses for physical/oral evidence.
13. I seek expert help to evaluate the scene (at times) and to reconstruct the occurrence.
14. I integrate the total evidence: the eyewitness accounts, the circumstantial evidence, the medico-legal evidence, the expert evidence and ensure their compatibility when I present the challan.

17.3 LOCATION

The main sources for the microtraces are:

1. The culprit
2. The victim
3. The Crime Scene
4. The weapon
5. The vehicle
6. The routes

17.3.1 The Culprit

The culprit carries traces on his clothes, on his shoes, in his hair, underneath his nails, or on his sexual body parts in case of sexual offences. Trace evidence may be in the form of stains or material sticking on his person or it may be in the form of dust particles. He may carry the traces of liquor or drug even in his breath, blood or body.

> *In a case of sexual murder, the culprit left a saliva stain on the cup in which he had taken tea. The fact eliminated his husband as the possible culprit and indicated that the murderer was someone known to the victim. Later on, it provided corroboratory evidence to prove his guilt to the hilt. (CH)*

The culprit carries standard exemplars. They are matched with the traces he left at the scene of crime or with the victim or on the objects with which he came in contact. They link him with the crime/crime scene/victim.

17.3.2 The Victim

The victim carries traces in the same fashion and at similar places as the culprit. In addition, powder residues in cases of shooting, needle marks in case of killing by injecting poison or even traces of poison at the point of administration may be available on the victim.

Like the culprit, the victim provides standard exemplars to match the traces that the culprit has picked up from him.

> *In a case of sex murder, there was a physical struggle. In the process, the culprit picked up wool fibres from the sweater of the victim. He also picked up feather fragments from the pillow used by the victim to defend herself. Later, when the culprit was apprehended, the fibres recovered from the coat that the culprit had been wearing at the time of struggle, matched with the fibres recovered from the sweater of the victim and the torn pillow in spite of the fact that the culprit had got his suit dry cleaned, some tiny fibres continued sticking to the coat. (CH)*

17.3.3 The Scene

The scene of the crime is a rich source of trace evidence. Saliva on cigarette stubs, on cups or glasses, ash from cigarettes, dust, fibres, and body fluids. are important traces offender leaves at the scene. He may also leave objects like garments, shoes, weapons of offence, vehicles or other items at the scene. They carry traces from the culprit which link him with the crime.

> *In a case of dacoity, the culprits hijacked a bus to escape from the scene. They abandoned it later. On search of the vehicle, the police not only found fingerprints but also plenty of microtraces like hairs, fibres and dust, etc. which ultimately, helped the police to link the culprits to the vehicle used in the dacoity. (CH)*

In addition, the scene provides matching evidence for the traces, which the offender picks up from the scene. For example, if the offender has entered the house after breaking window pan, He is likely to carry tiny glass fragments on his person (in his hair and or embedded in his body parts), garments, shoes. Their comparison with the glass from the window can link the culprit with the scene/victim.

17.3.4 The Weapon

The weapon of offence often carries tell-tale traces. In suicide cases, if the firearm is pressed against the body, blood, skin, flesh, even tiny particles of bone may be sticking to the inside of the barrel, at the muzzle end.

> *In an interesting case, a culprit was standing in a queue to board a bus. When the bus started moving, he was still in the queue. He gave a knife blow to his victim and before the persons standing there could catch the offender, he boarded the running bus. He left the bloodstained knife in the bus and vanished after getting down at the next bus stop.*
>
> *The police recovered the knife from the bus. It was stained with the blood of the victim. The IO had also found rabbit hair on the knife handle. Later, when the culprit was apprehended, matching hair were found on the clothes of the suspect matched, though the hare skin gloves were not recovered. The traces on the knife provided excellent corroboratory linking evidence to connect the culprit with the victim/crime. (CH)*

The weapon leaves traces in the form of marks or injuries, on the person of the deceased or the injured; or, may leave its fragments of the weapon on the person of the victim or at the scene. They provide excellent, often definite, linkage, in many a case.

> *In a simulated case of suicide, a sawn off gun was lying close to the body of the deceased, as if he had shot himself. Examination of the gun revealed that the gun barrel was freshly sawn off. The cut piece of the barrel and the hacksaw were searched for. They were not found in the house where the dead body was found. Murder was suspected. A hacksaw was recovered from the house of a suspect. Tiny particles on the hacksaw connected it with the sawed-off gun, linking the suspect with the murder. (CH)*

17.3.5 The Vehicle

The entities like a dead body, stolen or contraband goods, injured person or even kidnapped person transported in a vehicle leave their traces in the vehicle. They provide useful link evidence.

> *In a case of theft, a number of plates of lead batteries were stolen. The suspected vehicle had some black stain in the boot space. Examination of the stains chemically, revealed that they had come from the lead plates. (CH)*

The mud or dust picked up by the vehicle from the crime scene or deposited at the scene, links the crime vehicle with the crime scene/the criminal.

The cigarette stubs, cigarette ash, fibres exchanged, hair shed, perspiration, saliva found in a vehicle can provide useful trace evidence.

Fingerprints on the rare view mirror of the vehicle, if found, provide a definite identity of the driver.

17.3.6 The Route

Offenders often discard unwanted incriminating evidence on their flight from the scene. Sometimes important pieces of evidence are recovered from the route, which helps to pin the crime to the offender.

> *In an interesting case, the offender had murdered the victim in a secluded place. The police searched for the weapon at the scene and at the residence of the culprit, but without success. They then reasoned that he might have thrown the weapon en route. There were three footpaths, all about 5 kilometres each (from the crime scene to his residence). He could follow any route. It was fixed by examining the dust on the shoes of the culprit. The IO then followed the route examining all possible places where the weapon was likely to be thrown. He recovered the weapon from a bush thicket. (CH)*

17.3.7 Location Techniques

Location of trace evidence is usually more difficult than the macro evidence. The investigation officer usually uses the following gadgets:

1. Magnifying glass
2. Strong light
3. UV lamp

As a rule, whenever possible, the article suspected to carry trace evidence is transported to the laboratory if it can be done without loss of the evidence. The laboratory has the proper equipment for locating and collecting the evidence:

1. Wide spotless (white) examination table
2. Large shadowless lamp
3. Stereomicroscope with a movable flexible arm
4. Polilight
5. An array of locating chemical agents

The most important equipment to locate trace evidence is the trained eye and tuned brain of the IO who carries out the search. Usually, the Forensic Science Laboratories also possess such expertise and provide help.

Nowadays, most of the police departments have mobile laboratories or scientific teams for crime scene inspection. The team join investigations in all important cases. The team has the necessary equipment and expertise to locate the trace evidence. They locate the ever-present trace evidence and provide leads for further investigation.

17.4 COLLECTION

Collection of minute microtraces is somewhat a difficult task. The IO has to be experienced and well versed in handling minutiae. He gets the help of the scientific crime scene team whenever he needs assistance. Once the trace evidence is collected (and preserved), the investigation officer follows the standard routine drill to ensure:

1. Identity of the evidence
2. Integrity of the evidence

3. Authenticity of the evidence
4. Intact chain of possession of the evidence

The techniques used for the collection of micro evidence depend upon the nature of the microtrace and the sub-strata. They are:

1. Handpicking
2. Taping
3. Vacuuming
4. Scraping
5. Dissolving — solvent action
6. Clipping
7. Collecting the object carrying the trace evidence

Collection of the objects carrying traces and clipped items need special care. The microtraces thereon are to be protected from loss in transit, contamination or mutilation.

17.4.1 Handpicking

It is the method of choice whenever it is possible. It ensures the purity of the microtraces, proper fixation of their location and individual collection and separation. The process saves both time and effort.

The picked-up evidence is placed appropriately in small-sized clean containers. The purity and cleanliness of the same are ensured before placing the evidence in the container. Plastic containers often develop static a charge. They can repel the tiny trace materials, which may get lost in the process. In such cases, paper or glass containers should be preferred.

Ordinarily, the tiny traces do not need preservation from chemical changes or putrefaction. However, certain bio-traces (e.g., body fluids) may need treatment to preserve the trace from putrefaction or disintegration. Certain vapours may also get lost due to absorption or diffusion. They need protection. Besides, if the evidence is wet or on wet substrata, it should always be dried before packing.

Handpicking needs no elaborate paraphernalia. A strong light source, a magnifier, in some cases a magnet, a forceps with sharp thin tips, and a strong Tungsten fine-tipped needle are all that is needed. An operating zoom stereomicroscope on a zoom stand, if available, proves more helpful than a magnifier.

17.4.2 Taping

Taping for microtrace evidence is not only a successful and useful method but also an indispensable method in some cases, especially for the micro-evidence which is too small for handpicking or which is not easily discernible against the background. The method involves the use of adhesive tape(s) of 2 to 5 cm in width. The tape should be strong, clear, transparent and colourless, chemically inert and stable. There should be only a thin layer of the adhesive to prevent immersion of the small particles in the adhesive. The tape is pressed against the microtrace evidence carrying substrata. The adhesive picks up the evidence. The picked up evidence is preserved by covering the evidence carrying tape with fresh length of the same tape. Thus, the microtrace is sandwiched between the two layers of the tape. Alternatively, the tape is pasted on clean, transparent and clear acetate or a glass sheet. The microtrace is embedded in the adhesive and is protected by the sheet and tape.

The taping technique has certain advantages:

1. It is possible to pick up the finest trace by this method.
2. Isolation of the individual constituents is easy.
3. Preservation of the evidence is convenient.
4. It is not contaminated after the collection.

The tape picks up traces from plain or curved surfaces. It may miss traces in the crevices unless the investigator is careful. Likewise, it may miss traces embedded in the substrata. Moreover, the *substratum* may transfer its own material, especially if there are loosely held fibres or particles. The method is also not practicable on wet or oily surfaces.

A piece of the substrata material is always collected and sent along with the trace evidence.

The taping method is bound to be used frequently in the coming times. The tape should be, as seen above, thin but strong, clear and transparent; of a width of 2 to 5 cm. The adhesive thereon should be inert, soluble in organic solvent (Xylene!) and the layer should be neither too thick nor too thin.

17.4.3 Vacuuming

Vacuuming is an ideal technique for:

1. The collection of professional dust
2. Ascertaining the area through which the subject has travelled/passed
3. Collecting evidentiary traces from large areas
4. Collecting trace evidence in crevices

The technique is not good to collect traces exchanged in a single contact, which is common in most of the crime situations. Besides, it collects old traces which have no relevance to the crime and create problems at times. Consequently, it is used only when the other techniques prove inefficient for recent traces.

The technique involves an ordinary household vacuum cleaner with a modified suction end. The suction end is fitted with a rubber bung in which a glass tube is fitted. A pressure tube is attached to the outer end of the tube. The free end of the rubber tube is attached to a cassette, fitted with a cellulose acetate membrane (filter) trap that retains the microtraces. The open cassette is moved along the surface after putting the vacuum cleaner on. The arrangement is good for small areas, individual clothes, shoes, even for bed sheet, sofa sets, chairs and seats in vehicles including that of aeroplanes. The membrane filters can be stored conveniently in the cassette itself or in similarly shaped containers. Cellulose acetate membranes (filter traps) are changed frequently, using separate filter trap for each item of clothing or one for each specified area.

The laboratory technician uses Petri dishes to collect microtraces.

Vacuuming suffers from the following lacunae:

- It collects all old/new dust, substrata particles.
- It dilutes evidence. Additional dust may be from the ‘real criminal’; other than the suspect/accused. The defence argues.
- Fixing the site of collection of the microtrace evidence needs care.

Vacuuming is not used in those cases where microtraces can be collected by handpicking or taping. If necessary, the vacuuming is done after these processes.

17.4.4 Dissolving and Washing

To a novice, use of washing technique, to collect microtraces, might appear puzzling. But it becomes indispensable in some cases. For example:

1. A tiny fragment of a petal is embedded firmly in a small mud stain. Attempts to remove the fragment will further break up the petal and make examination difficult.
2. A small oily or greasy stain is sticking to clothes, covering tiny soil particles. They can be collected only after dissolving the oily material in a suitable solvent.
3. Tiny body fluid stains.

The washing technique is not used frequently. However, when it is indispensable, the sticking trace has to be carefully examined to determine its nature, in order to select the appropriate solvent. The solvent may dislodge the stain with the help of a tungsten needle. At times, ultrasonic bath may be needed to dislodge the evidence. The minimum amount of solvent is used. In case a large amount of solvent has to be used, the trace material is concentrated with a centrifuge.

17.4.5 Scraping

Scraping of stains of appreciable dimensions is common in most of the laboratories. It may not be feasible with tiny stains. A spatula or a scalpel is the usual gadget for scraping the microtrace. However, a Tungsten or Platinum needle with a flattened tip is better. The scraped material is collected on to a paper. It is preserved by folding or transferring it to some other container like a watch glass/Petri dish.

Scraping is inefficient, as it does not often dislodge the total material. It also does not allow the strongly adhered material to be scraped off without being contaminated by the substrata material. In scraping, substrata material is taken into account. The danger of contamination, in tiny stains, is real and ever-present.

Laboratory technicians do not use scraping is when they have the stain bearing article itself.

Microtraces need care in packing. The small amount and sizes make it essential that the material is not contaminated or lost. The following table gives a proper packing mode:

Table 17.1

Microtrace Packing

S No.	Microtrace	Packing
1	diatoms	Side/plastic envelopes
2	Industrial dust	Vials/paper fold/plastic envelops
3	Mineral	Vials/paper folds and plastic envelopes
4	Pollen	Vials/paper folds and plastic envelopes
5	Polymers	Paper folds/envelopes/vials
6	Spices	Vials
7	Wood	Vial/slides
8	Fibres: Natural/synthetic	Paper folds/envelopes
9	Food products grains	Vials/paper folds and envelopes
10	Hairs	Plastic envelopes

17.5 FORENSIC PROBLEMS/POSSIBILITIES

Evaluation of microtraces can provide answers to the most important questions in forensics:

1. Do the collected microtraces fix the identity of the culprit/victim?
2. Do they identify the crime scene(s)?
3. Do they indicate the *modus operandi* of the culprit(s)?
4. Do they identify/indicate the type of weapon of offence used?
5. Do they link the vehicle with the crime?

In addition, they answer many other Forensics problems, including the following:

1. Are the microtraces, found on the person of the suspect (including his clothes, shoes), from the crime scene, from the victim or from the objects/materials at the scene?
2. Are the microtraces left at the scene from the culprit (or from his clothes, shoes), from his weapon of offence or from the vehicle that was used in the commission of the crime?
3. Do the microtraces provide corroboratory/definite evidence to link/delink the suspect with the crime?
4. Which of the given versions of occurrence is supported/contradicted by the collected microtraces?
5. Do the microtraces help to reconstruct the occurrence?
6. Do the microtraces indicate the sequence of events?
7. Do the microtraces provide some leads for further investigating?

17.6 EVALUATIONS

Fig. 17.2

Scanning electron microscpoe (SEM), the ultimate tool in microtrace analysis

Microtraces, as already seen, involve all types of entities. The nature, composition and state of the traces vary from case to case. The only common denominator is their small size/amount. The examinations have, therefore, to be trace-specific and quantity-specific. However, the micro-analyst has an array of instruments and techniques, which are sensitive, specific and time-effective. The analytical results he produces are simply miraculous.

17.6.1 Tools and Techniques

The tools and techniques used for the evaluation of evidentiary clues, in general, are applicable to evaluate microtraces also. The only difference is that in some cases they are modified to make them suitable for minute quantities. The important tools and techniques include:

17.6.1.1 Microscopy

The single most important technique in the examination of microtraces is microscopy. It helps to locate the evidence, to isolate it and determine its physical nature, and with modern advances its chemical nature as well, even at sites.

Microscopy helps to study and examine the evidentiary clues in their varied aspects: morphology, size, crystal structure, refractive index (Beckline method) of transparent objects, density (floatation method), even chemical nature by colour reactions or crystal formation.

Indispensable instruments in this category are:

1. Scanning Electron Microscope (SEM)
2. Stereomicroscope
3. Petrographic microscope
4. Polarized light microscope
5. Phase contrast microscopes
6. Fluorescent microscope

These microscopes are proving highly effective in the discrimination and identification of microtraces, especially of synthetic fibres and of other polymers.

Scanning Electron Microscopy (SEM) has revolutionized the examination. It can indicate the morphology in its finest form. With EDX, it can determine the elemental compositions. SEM has drastically changed microtrace analysis complexion:

1. Its very high magnification and unbelievable resolution reveal structural details, which permit discrimination and identification of the tiniest particle, provided the analyst has necessary standard data and experience.
2. It identifies Gun Shot Residues (GSR) through its morphology and chemical composition. It contains small lead balls and lead, barium, antimony. Their presence specifies the GSR.
3. It identifies a shooter through the identification of GSR on the hand the shooter.
4. It is capable of giving both qualitative and quantitative analyses.
5. It is capable of giving even the number and sizes of the particles, with special software.
6. Energy dispersive detectors permit the identification of almost all elements having an atomic number greater than that of fluorine.
7. Crystal detectors analyse wavelengths. Though a cumbersome technique, it provides a quantitative analysis of elements having an atomic number greater than four.

17.6.1.2 Micro-chemical Tests

Theoretically (and to an extent, practically also) micro-chemical tests can identify the chemical nature of the trace evidence. However, in practice, they are on the way out. They may be used now and then for confirming the nature of a particular trace, which has been more or less identified by microscopy or by other physical characteristics. The small amounts and destructive nature of micro-chemical methods inhibit its extensive use. Non-destructive instrumental methods are being used increasingly.

17.6.1.3 X-ray Diffraction

X-ray diffraction technique is not used extensively in our country. However, in competent hands, it can be very useful especially for analysis of structural materials, paint fragments, fertilisers, corrosion products.

In principle, the technique is simple. X-rays are passed through the tiny particle to be analysed. The X-rays are diffracted by the elements in the particle according to their disposition in the crystal. The diffracted patterns are photographed. The circular bands obtained at various distances (element-specific) from the centre. Intensity of bands is directly related to their concentrations. Reference to the standard tables and comparison indicate the identity of the entity.

17.6.1.4 Micro-FTIR Spectroscopy

Fourier Transform Infra Red (FTIR) spectrophotometer has changed the complex of identification of microtraces of organic nature, especially of polymers, synthetic fibres, paints, drugs, plastics. It can analyse even the particles of the order of 20 μm.

The technique has been extended for those organic materials which contain some inorganic materials also — by micro pyrolytic technique, where pyrolyzate organic material is identified by FTIR spectrophotometry and the "ash" left can be identified by microprobe.

Many other techniques like Gas chromatography (TLC, LC, GC), Mass Spectrograhy (MS), Microspectrophotometer (MSP) are also being used infrequently.

Analytical techniques have truly crossed all physical barriers. One can analyse even the tiniest clue material both qualitatively and quantitatively. The outstanding example is the analysis of drugs (or their metabolites) in the hairs of addicts in quantities which surpass imagination (nanograms/picograms!). The instrumentation has reached the zenith and can meet any analytical demand of microtrace analysis adequately, most of the times.

17.6.2 Data Bank

The most important weapon in the hands of the analyst is proper, adequate reference source(s) for the various types of materials so that he can check the findings with them for confirmation.

There are two types of sources:

1. Atlases
2. Museums

The analyst should be aware and have liaison with the data source people. In fact, if the number of such cases is large, the analyst should organise his own reference source.

17.7 INDIVIDUAL MICROTRACES

Anything can leave a microtrace. It is not possible (nor necessary) to discuss all of them in the present works. Here only those microtraces, which are frequently involved in forensics, have been discussed briefly to indicate their potentialities and how they are processed.

Microtraces are often as mixtures of many materials. Whenever possible, the entities are separated with the help of a magnifying lens, (or a stereomicroscope), under proper lighting (shadowless lamp) and a pointed, sharp and stiff tungsten/platinum needle. The individual microtrace, is then, studied in detail.

17.8 PLANT MATERIALS

Plant material microtraces are fragments of wood, bark, leaves, flowers, seeds, pollen, plant fibres, fruit pulp, starches, and crushed leaves, flowers or seeds. The plant microtrace may also be a stain of crushed materials.

The examination starts with microscopic morphological studies. Detailed microscopic examinations, is done after preparing radial, transverse and longitudinal sections of the evidential fragment(s). When microscopy does not help much (stains or crushed or pulped materials), micro-chemical/biological tests are used to ascertain the nature of the trace.

New techniques based on cell materials, on the pattern of DNA profiling, are known. They are waiting for exploration/exploitation. However, DNA technology is costly and time-consuming. Besides plant microtraces are not frequently involved in Forensics. Therefore, it is used only in important cases. A reference to Forest Research Institute, Dehradun is of great help. The Institute has an excellent specimen museum and expertise of very high order, *vis-a-vis* plants and plant products.

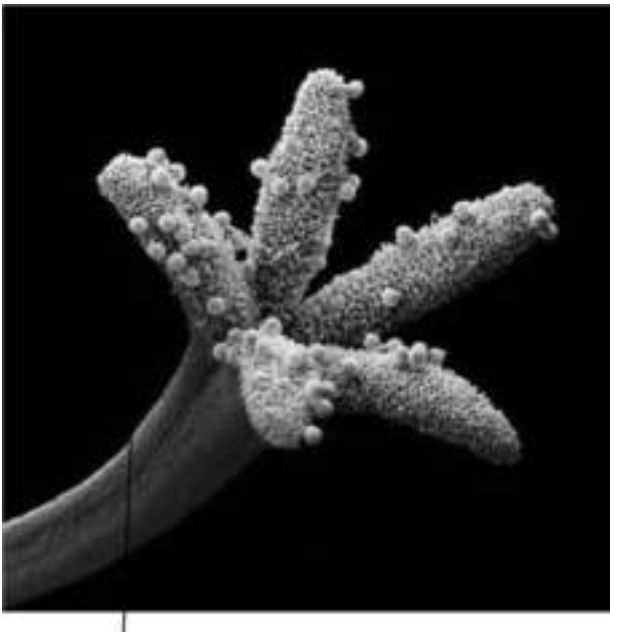

Fig. 17.3
Pollen grains on flower

17.8.1 Wood

Wood as microtrace evidence occurs in the form of sawdust, paper shreds, fillers in polymers, professional dust (of carpenters and workers in furniture-making units, for example). Saw dust is usually from heterogeneous trees. The heterogeneity helps the identification of the source.

It is possible to identify the nature of the wood even from a single particle, from the variations in cell structures. The work is facilitated with a reference library. Computerised data banks have been proving to be a big help in the identification of wood microtraces.

17.8.2 Leaves

Fragments of leaves, as microtraces, are encountered in many situations, for example, cannabis abusers can be identified from the presence of cannabis leaf fragments, on the person or their paraphernalia. Many herbal drugs (powders, residues plant plants) are used as plant poisons. They may be part of the dust picked up from the scene, route(s), site of disposal. They may be part of the explosive debris fallen off the culprit. Or, they may be part of narcotics, particularly of the cannabis or opium family.

The fragments of leaves are often identified from the varying structures, their fibres and colour. Scanning electron microscopy, along with a reference library (data bank) and expertise help. In difficult cases, a plant anatomist and taxonomist should be consulted. Herbaria and botanical gardens are useful sources for standards. In the case of certain plants, specificity of the hair make identification of the material easy, e.g., the horny hair on cannabis leaves permit easy identification of cannabis products.

Fig. 17.4

SEM photograph of cystolic hairs on the leaf of cannabis.

17.8.3 Flowers

Fragments from various parts of the flowers can occur as microtraces in almost all types of cases. They have the advantage in that most of the flowers are seasonal. Thus, they indicate the season when the culprits may have picked up the traces. Though all parts of the flower are important, the pollen grains have proved to be exceptionally useful in forensics.

17.8.4 Pollen grains

Pollen grains are time-/location-specific. They, therefore, indicate when and where the subject has been moving about. If the pollen is of the type transferred by the insects, the scene of

occurrence is also indicated, as the subject must have picked up the pollen from the scene where he had come in physical contact with the flowers. The presence of pollen in adequate quantities (and that of seeds from weeds) has often linked the rapist with the rape site and the victim, in outdoor crime scenes.

> *Examination of crude opium indicated that it had been cultivated in a field which had maize crop, as the opium contained pollen grains of maize. It appeared that the cultivator had planted the opium plants in a field where maize crop was being grown, to conceal the poppy plants. Search of the suspected area revealed the field where the stumps of both the plants (maize and poppy plants) were found. (CH)*

Pollen grains are identified after boiling them with acetic anhydride and sulphuric acid (9:1) and studying the skeleton. The structures of the pollen grain skeletons vary extensively from plant to plant. They are studied through SEM. For definite results, authentic samples of the pollen are required.

Study of pollen grains is called 'Polynology'. It has not been exploited extensively in forensics. But in certain blind murders and in some other cases with rural a background, where there is little else to go by, pollen search, examination and comparison may prove useful.

17.8.5 Seeds

The importance of the identification of seeds can be visualised from this case:

> *A girl alleged rape by an elderly person. She indicated the spot. The investigating officer not only noticed the disturbance and a semen-like stain at the spot, he also saw that the site was infested with a rare type of weed, which had ripened. He collected some seeds from the weed. He sent them for examination to the expert along with the clothes of the suspect and the victim. The expert found corresponding seeds on the clothes of both. The suspect, who had been denying visiting the spot, confessed to the crime. (CH)*

Seeds, as microtraces, are found in a number of crime situations in outdoor crimes. Besides, they are found in dust/mud fallen from the hit and run case and in other vehicular accidents.

Seeds are identified from their morphology. SEM gives the best results. Internal morphology of the seeds and micro-chemical and biological tests for some specific chemical constituents also help. The expert requires reference/specimen seeds for comparison and definite results.

17.8.6 Starches

Starches, from different sources (plants), vary in their structures, which permit the identification of the source. Starches from food material, food/fruits form microtrace evidence in some cases. The source is identifiable in most of the cases. If the starch has hydrolysed, the basic structure goes off and the identification may not be possible.

Microscopy and staining are used to identify starches. Standard samples should be available for comparison. Photomicrographs of starches are poor substitutes for specimen samples.

17.9 DUST

17.9.1 Definition

Dust are fine particles of matter of anything and everything. They come from all types of sources such as soil, dust lifted by weather (an Aeolian process), volcanic eruptions, and pollution. Dust in homes, offices, and other human environments contains small amounts of plant pollen, human and animal hairs, textile fibres, paper fibres, minerals from outdoor soil, human skin cells, burnt meteorite particles, and many other materials which may be found in the local environment.

17.9.2 Nature

The dust is an all-inclusive heterogeneous mixture of materials. It may consist of anything and everything. As already seen, it depends upon the soil of the place, its flora and fauna and the activities of man, animal and beast at the site or suburbs which are being carried out at the place including the weather condition of the place, geographical feature of the land.

Dust vary from place to place, mainly due to its varying constituent materials:

1. **Soils;** Sand, soil, plaster particles, metals, grit, rust, minerals, and diatoms
2. **Plant**; Wood, bark, twigs, starches, sawdust, wood splinters/shavings, leaves, flowers, petals, pollen, plant hairs, fibres, and seeds
3. **Animal, beasts, bird materials;** tiny fragments of feathers, hairs, skin, bone, hoofs, horn, flesh, body fluids, excreta
4. **Human**; hair, body fluids, skin, flesh, bone fragments or their degradation products
5. **Man- made materials**; construction material, glass, paints, polymers, chemicals, food materials, synthetic fibres, plastics, dyes, and sawdust
6. **Unusual entities**; Microorganisms, sub-life
7. **Professional dust**:
   - A coal miner will carry coal dust.
   - A miller will carry flour of various grains being ground at the mill.
   - A textile mill worker will carry fibrous fluff.
   - A farmer carries farm soil and plant materials.
   - A carpenter carries wood dust.
   - A safe breaker carries sawdust, and so on.
   - A dyer carries dye stains

Professional dust have great potential for the identification of unidentified dead bodies of culprits, victims of disaster/road accident, suicide, lost persons. Professional dust has helped to identify many a culprit/victim/dead body.

17.9.3 Importance

Dust is an important microtrace; because of its frequent availability in forensics. They help to establish *corpus delicti*, link the entities involved in crime, identification of men, materials and situations, verification of versions, sequence of events and permit reconstruction of occurrences. Yet, unfortunately, this type of evidence is rarely utilised in India, not even in one per cent of those cases where it should be helpful.

17.9.4 Collection[2]

Collection of dust needs special care and attention as the amounts involved are truly small and are easily contaminated:

1. Fix the location of the evidence.
2. Whenever possible take the item bearing dust to the laboratory for better and contamination-free collection.

2. Detailed methods of collection are given in **section 4. Collection**, above.

3. Use 2 to 5 cm wide adhesive tape for the collection of dust.
4. Vacuuming should be the last resort.

Dust, as associative evidence, is ever-present. It must be utilised.

17.10 SOILS

17.10.1 Nature

Soil is the top surface material of earth. It consists mostly of clay, silt and sand. In addition, it has coal, chalk, minerals, plant fragments, humus, microorganisms and other items.

17.10.2 Importance

Soils have great importance as evidence in a criminal investigation:

1. They are available in most of the cases involving outdoor activities. Unfortunately, the normal investigator is not fully aware of their potentialities as evidence. Hence, he does not utilise them fully. Due to increasing scarcity of the traditional evidence, the soil as evidence might be used more frequently in the coming times.
2. The soils are individualistic due to the variability of their constituents. They differ from place to place. Nature, human beings, animals, beast and vegetation change their identity. Wind or rain may bring/take away fine soil particles, plant materials or other materials. The man throws his discards. Animals, insects and microorganism change the soil continuously. Plant deposit twigs, leaves, seeds, flower petals.

   Soils, like other microtraces, link the criminal, the victim, the scene of the crime, the vehicle, the weapon of offence and other paraphernalia involved in the crime *inter se*. It identifies the scene. It may identify the place from where the person (the culprit, the victim) or the vehicle has come.
3. Soil examinations have provided useful evidence in a variety of cases:
   - *The soil on the shoes of a suspect did not correspond with the soil from the scene or with the soil from his residence. Ultimately, the suspect led the police to the site where he had buried the stolen ornaments. The soil from the place tallied with the soil on the shoes of the suspect. (CH)*
   - *The soil on the clothes of the victim of a rape identified the scene of the crime. Additional evidence at the scene provided the necessary corroboratory evidence to link the culprit with the crime. (CH)*
   - *The soil on the deceased victim was different from the soil where the dead body was found. The finding indicated that it was a fake crime scene. (CH)*
   - *Soil cake dropped by a hit and run vehicle (truck) ultimately linked the vehicle with the scene. (CH)*
   - *Soil on the shoes of the suspect murderer was utilised to find out the possible route (out of three routes), used by the suspect after the murder. Three persons put on similar shoes and walked the routes. The correct route was identified by comparing the soils on the three pairs of the shoes with the one recovered from the shoes of the suspect. (CH)*
   - *The theft of saplings of plants was proved by comparing the soils attached to the roots of the saplings with the soil from where the plants were stolen. (CH)*

- *In a case of murder, the soil sticking to the clothes of the suspect and the soil of the place where the body was found did not tally* inter se. *It was suspected that the scene of crime was elsewhere. The soil sticking to the clothes ultimately helped to locate the correct scene. (CH)*
- *In a case of murder, fresh soil was found in the welt of the shoes of a culprit. It ultimately linked him to the place from where the buried dead body of the victim was recovered. (CH)*

17.10.3 Location/Collection

Soils are found on the shoes, clothes, vehicles, stolen goods, implements, weapons. It may also be found in the hair of the suspect. The amount of available questioned soil varies. Collection, preservation and dispatch follow the usual microtrace handling pattern.[3]

17.10.4 Soil Examination

Soils examination techniques vary tremendously. The amount and the nature of the questioned soil determine the choice of the technique. The general evaluation drill is:

1. **Visual examination**; it indicates the colour, texture and presence/absence of some gross items.
2. **Microscopy**; it is the most useful tool for soil analysis in its varied forms. Stereomicroscope and petrographic microscopes have been extensively utilised in the past and have their utility beyond doubt. They help to identify the individual particles through their morphology, optical properties and observations of chemical reactions on micro scale. The evaluation of soil starts from microscopy.
   - If certain conspicuous particles like those of stones, metals, bone, paper, coal, chalk, minerals, seeds, plant material fragments or seeds are discovered, they are picked up and compared with corresponding particles in the standard sample, separately. The standard larger sample should contain all or most of the particles.
   - The colours of the soils vary tremendously. Non-match of the two samples, under normal conditions, eliminates the possibility of the common sources. The colour of the minerals is sometimes masked by humus. It should be unmasked. Water contents of the samples also affect the colour. It is taken into account. The colours of the soils are also examined after heating the samples to different, but corresponding, temperatures.
   - The comparatively small amount of the samples does not permit the comparison of the particles, through sieving. The particle sizes of soil vary. Special types of measuring microscopes especially SEM are used for this purpose. The sizes of the soil particles commonly found are:

Table 17.2

Soil particle size

a. Clay	up to 2 micron
b. Silt	up to 20 micron
c. Sand	0.2 to 2 mm

3. Kindly see **Section 4. Collection**.

3. **Settling time;** if the sample is large, the material is sieved through sieves of various meshes and the fractions are studied microscopically.

   The questioned and standard samples are centrifuged and the time for settling and layer formation provides the comparison of sizes and the amounts.

4. **Density**; density of a soil sample depends upon the density of its particles. When a soil sample is suspended in a density gradient column, the sample is distributed over a length of the column. The pattern of spread is characteristic of the place. It is not duplicated by a sample taken even from a place quite close to the place of the first sample. The differences increase if the samples are collected from distant places. If, however, samples are collected from the same place and in the same way, they show the identity of the distribution pattern in the gradient tube.

5. **Chemical Analysis**; chemical analysis of soil is a tedious and laborious task. It is seldom attempted. However, paper chromatography for amino acids in soil samples is simple and holds some promise.

6. **Differential Thermal Analysis**

   The complexity of the soil makes this technique ideal for the examination. It is likely to be used on an increasing scale in the coming years.

7. **Micro-organism Analysis**; the identification of micro and macro-biological life in a soil sample is theoretically an attractive technique but the practical work involved has not been streamlined so far.

8. **Scanning Electron Microscopy**; Scanning Electron Microscope is now the tool of choice for the evaluations of soils. It gives not only the sizes of the particles but their number and the chemical composition also. The method has not been exploited fully. The technique offers unlimited opportunities to the soil analyst.

17.11 FIBRES

17.11.1 Importance

Transfer and cross transfers of fibres frequently take place among persons, places and paraphernalia *inter se* through wearing apparel, carpets, upholstery, bedding when they come in contact. Fibres surround us all around. So much so, it is difficult to imagine a person who would not exchange fibres even in his day-to-day contacts. This transfer/cross transfer also takes place in crime situations. The fibrous evidence, therefore, should be available, most of the time, in most of the crime situations, on most of the persons and materials involved. Mutual exchange once established clinches the case against the accused, as it provides the necessary corroboration, especially in cases of offences against the person, to the main evidence.

Fibres are valuable evidence because of large variety. It has been calculated that if six different common fibres (different in colour, sizes, material, treatment or extent of use), have been exchanged, they provide the linkage. The probability of reoccurrence of such exchange, on a conservative estimate, is one in 64×10^6. A similar exchange of eight fibres reduces the probability of reoccurrence to one in 256×10^8. If the fibres are of rare types, they provide a still higher linking probability.

Fibrous evidence is often inconspicuous. It remains unnoticed. The culprit, therefore, does not destroy it. For the same reason the evidence also remains undisturbed. However, all the exchanged fibres do not remain attached to the sub-strata. In fact, most of the fibres are shed off soon. Some, however, resists shedding and even withstand dry cleaning or washing. They provide excellent evidence even after long periods:

In a case of rape- murder, the victim resisted. A scuffle ensued, as was evident from the disturbance at the scene. The investigator was sure that the culprit must have carried fibres from the scene. The culprit was apprehended after months. However, the jacket of the culprit, in spite of dry cleaning, still carried fibres from the sweater of the victim and from the pillow. (CH)

Unfortunately, the fibre evidence is considered weak evidence. The non-professionals think that it offers no individualising features. It is not true. The fibres have numerous discriminating characteristics including the following:

1. Chemical composition
2. Manufacturing process
3. Dimensions
4. Dyes
5. Optical properties
6. Adventitious impurities picked up in the manufacture or while being used (melting, paint smear or other stains)
7. Age-related changes in the fibre material.

The fibre evidence can save innocent suspects:

In a case of burglary the suspect denied entering the house where costly items like jewellery were stolen from a carpeted room. The shoes of the suspect smeared with mud carried about 50 different types of fibres. None of them corresponded to those of the carpet. The mud on the shoes that corresponded with the mud from the club grounds corroborated his alibi *that he was in a particular club at the material time. (CH)*

The new technologies, new and ever-increasing number of materials, more and newer modes of manufacture and ever-increasing sophistication in examination techniques can give near individualistic identity. Besides, cross transfer and variations in transferred fibres can fix the culprit-victim contact. We have no quantitative probability values for all types of fibres. However, it is believed that cross-transfer of two or more fibres of uncommon nature should clinch the contact issue.

17.11.2 Nature

Fibre is defined as a natural or synthetic material that is significantly longer than its width or diameter. There are many types of fibres, including:

17.11.2.1 Plant Fibres

The commonest and important plant fibres, in India, are cotton, flax, hemp, jute and coir. However, there are other fibres obtained from other plants though they may not be common. The latter can also figure in crimes sometimes. Formerly, plant fibres dominated the cloth, clothes and upholstery industry. They are more comfortable to wear. Synthetic fibres are now being used increasingly because of their strength and cost.

17.11.2.2 Animal Fibres

The frequently utilised animal fibres, in India, are wool, mohair, cashmere, angora, feathers (down feathers for pillows, quilts). Camel, goat and other animal hairs have also been utilised.

Animal furs are also used as dress materials and their fur fibres, sometimes, figure in crimes.

17.11.2.3 Natural Silk

Silk is a natural protein (fibroin) fibre, produced by certain insect larvae. They form cocoons. The best-known silk is produced by mulberry silkworm larvae. Several other insects also produced Silk.

The silk fibre has a triangular prism-like structure which allows silk cloth to refract incoming light at different angles, giving scintillation appearance to silk.

In India, in addition to mulberry silk, there are other natural silks also. For example, Assam produces three different types of silk; namely, Muga, Eri and Pat silk; collectively known as Assam silk. Muga is also called the golden silk.

Silk Garments, especially the silk sarees, are the favourite dress of the elite ladies in India.

Silk fibre does come as evidence in some cases.

17.11.2.4 Mineral Fibres

Asbestos, glass and carbon fibres are the most important mineral fibres. They do come up as evidence in forensics.

17.11.2.5 Metal Fibres

Metal fibres are extensively used in textiles and for some other purposes, in India. Gold, Silver, Brass, Aluminium fibres are common. Metal-coated plastic fibres and plastic-coated metallic fibres are also in use. They and their fragments may also form evidentiary clues sometimes.

17.11.2.6 Modified Fibres

Rayons are modified cellulose fibres. Important varieties of the rayon are Acetates, Viscose and Cuprammunium rayons. They are extensively utilised in the textile industry. They have also manufactured fibres but their base is a natural fibres, mostly cotton and wood. Plastic coated natural fibres, like plastic coated coir is also used in mattresses and sofas.

The paper is manufactured from a variety of fibres, natural or synthetic. The disintegrated paper provides fibre evidence.

Naturally occurring proteins have also been used to produce modified fibres. For example, casein fibre is obtained when the alkaline solution of proteins is extruded through the acidic solution.

It is obtained when an alkaline solution of a certain protein is extruded through acidic solutions.

17.11.2.7 Synthetic Fibres

Synthetic fibres dominate the scene and it is becoming more and more dominant. The number of different synthetic fibres is already a legion and the number is increasing with vehemence with the passage of time. There are about 25 varieties. The main types are:

1. Acrylics—a big family
2. Polyamides—numerous nylons
3. Polyesters—varieties are increasing in number.
4. Polyvinyl
5. Fluorocarbons—Teflon
6. Olefins

Other synthetic fibres, which are likely to invade the industry increasingly, are chlorofibres, fluorocarbon and polyurethane elastomers.

In a case of homicide the body of a young woman was found at the edge of a rural road. The autopsy showed injuries typical of those produced by a car hit. Post-mortem examination revealed that she had strangulation marks also. Apparently, she had been run over after being strangled.

The police investigation led to the estranged husband. Debris from under-surface of his car was submitted to the laboratory and was found to include nylon filaments like those composing her panty hose and green woollen fibres like those composing her coat. Human blood was also identified on some of the nylon filaments. The husband was convicted for the murder. (CH)

17.11.3 Evidentiary Clues

Fibres provide the following variety of clue materials:

1. Individual fibres
2. Threads
3. Pieces of cloth
4. Clothing
5. A cord, string, rope or their piece(s)
6. Hairs from different sources
7. Furs.

17.11.3.1 Location

The main sources of fibrous evidence are the clothing, the bedding, vehicular upholstery, carpets, household furnishings, human and animal bodies, skins, furs, fur garments. Fibrous evidence may be sticking to the weapon of offence (sticks, knives, hammers, axes, firearms, and the like). The evidence may be found at the scene, with the culprits, with the victims, on the floors and on the objects at the scene. The search, as in other types of microtraces, should be carried out systematically and thoroughly. The search should be rewarding most of the times as transfers and cross transfers of fibres take place usually.

Location and collection of the fibrous evidence are rather troublesome, being almost 'invisible' against the background substrata. The novice may even miss the bus and lose the evidence. It is, therefore, advisable to send the article suspected to bear the fibrous evidence to the laboratory whenever feasible. Alternatively, the laboratory specialist is called to help in the location/collection of the evidence. If the investigator has to collect the fibres, he should:

1. Fix the location of the evidence through photography, sketching and textual record.
2. Ensure contamination-free collection — use transparent plastic small envelopes. Small fibres are kept in paper folds.
3. Use gadgets — hand magnifier, bright light, UV light, fine-tipped forceps.
4. Collect a small piece sticking to the substrata by scraping with blade or pin, as the situation requires.
5. Use separate packing for each garment. Fibres get easily exchanged and thus get contaminated easily.
6. Ensure extreme cleanliness for containers, storing place, examination table.

17.11.4 Problems

Study and evaluation of the fibre evidence can answer a variety of questions:

1. Has the fibre come from a particular garment, carpet, or any other given source?
2. What is the nature of the fibres? Are they foreign to the scene or the person where they are found? Or, are they part of the background where they have been found?
3. What is the evidentiary value of the given fibre evidence:
   - Definite linkage or de-linkage?
   - High probability?
   - Corroborative evidence?
4. Do the location, nature and pattern of the evidence indicate the sequence of events that may help in the verification of versions or identification of the real or fake nature of the scene?
5. Does the fibre, piece of cloth, string, and rope recovered from the scene match with the corresponding material recovered from the suspect or the victim?

17.11.5 Evaluations

The main evaluation techniques for the fibre evidence follow the general pattern of evaluating the microtraces. However, there may be some specific determinations to be made.

The evaluation involves the following steps:

17.11.5.1 Preliminary Examination

The fibres are examined visually, with a hand magnifier and under a stereomicroscope. The study indicates:

1. The twist of the thread, string, rope, or cord
2. The number of strands
3. The number of thread in the string
4. The number of fibres in each thread
5. The defect in the thread or weave pattern
6. The weft and warp thread counts of the clot.
7. Recovered torn piece of cloth originally formed part of the cloth (mechanical fit!).

17.11.5.2 Microscopic Examination

Microscopic examination is useful to find out:

1. The structure of the fibre
2. The nature of the fibre materials
3. The diameter of the fibre
4. The presence or absence of contamination
5. Colour of the fibre
6. Cross-sectional structure
7. Inclusions, including de-lustring agents

8. Adhering materials
9. Process failure defects
10. Damages, if any
11. Abrasion, wear

17.11.5.3 Use of UV/IR rays

Using ultraviolet rays (for fluorescence) and polarised light (for phase contrast) extends the microscopic examination and provides additional discriminating data.

17.11.5.4 Physical Properties

Physical properties like density, refractive index, melting or softening point and tensile strength give important information about the fibres.

17.11.5.5 Microtomy

A cross-sectional study of fibres reveals structural features that are otherwise difficult to comprehend. The technique is similar to the one employed in the study of hair.

17.11.5.6 Chemical Test

Burning, solvent action and staining techniques are employed for the evaluation of the evidence. Different types of fibres can be distinguished by systematic analytical techniques.

17.11.5.7 Differential Thermal Analysis

Differential Thermal Analysis is a useful technique employed for fibre analysis. Each fibre has a characteristic thermogram, which can help to establish the identity or otherwise of the common source of the questioned and the standard fibres. The technique, however, requires a comparatively large sample of about 25 milligrams and hence not useful in real crime cases where only a small amount of fibre is available.

17.11.5.8 Optical Properties

The following optical properties are useful for fibre identifications:

- Refractive Index
- Birefringence
- Fibre elongation

17.11.5.9 Fluorescence

- Presence or absence of fluorescence
- Colour and intensity of the fluorescence
- The exciting wavelength

17.11.5.10 Colour Comparison

Textile fibres are frequently dyed. The dye provides the following features for discrimination:

- Colour shade
- Fluorescence

- The Chemical nature of the dye
- The action of certain reagents on the dye

The usual process is to compare these features of the dyes of crime and specimen samples *inter se*.

In a case, the evidence sent to the laboratory consisted of a strand of yarn, approximately 1 inch long taken from the fender of the suspect's car. The report returned to the submitting agency identified the questioned yarn as having come from the shirt of the victim. This identification was based on colour sequence, strand length, yarn construction, and fibre type. (CH)

17.11.5.11 Microspectrophotometry

UV-VIS spectra of both the questioned and standard (specimen) exhibits are obtained and compared *inter se*. Correspondence in the two indicates a common source.

17.11.5.12 Infrared spectroscopy

Infrared absorption traces of a substance are individualistic in nature, like fingerprints. If the patterns of absorption of the infrared rays of the crime and the standard sample correspond, a common source is established.

17.11.5.13 Pyrolytic Gas Chromatography (PGC)

In this technique, synthetic fibres are pyrolysed under controlled conditions. The fibre gives degradation products which are characteristic of the material. If the chromatograms of the crime and the standard samples correspond, it indicates a common source of the two.

17.11.5.14 Thin Layer Chromatography (TLC)

Thin layer chromatography is the technique of choice for the identifications and comparisons of the dyes on fibres. It is highly sensitive, specific, rapid and simple. It does not involve costly equipment and can be used in all the laboratories. It is employed extensively for the purpose, all over the world.

17.12 GLASS

17.12.1 Importance

Glass, as an evidentiary clue has great importance because:

1. It occurs in a variety of crimes:
   - **Hit and run cases** and other road accidents.
   - **Burglary cases**; window glass is broken to affect entry/exit.
   - **Vehicles theft;** or stealing from the vehicles
   - **Shooting cases,** through glass windows on passengers sitting/travelling in a vehicle
   - **In brawls** where glass bottles are used as weapons.
   - **Gang wars**

     In a case of theft, a large amount of cash and ornaments was stolen. The police during the investigation found that a glass pan of a window was found broken. It

indicated that perhaps the thieves had entered the house after breaking the windowpane. However, the IO as a matter of routine interrogated the household servants to find if they were the accomplices of the thief. The replies of one of the servants created a suspicion that he was involved in the crime. Was he lone or had he some accomplice?

The IO reasoned that if he was the lone culprit, he would break the glass pane from inside. He sent the glass pieces to the forensic science laboratory. They reported that the glass was broken from inside!

The IO interrogated the suspect again more intensively. He confessed to the crime. The police recovered most of the stolen money/ornaments. (CH)

2. The glass evidence is highly individualistic. The discriminatory factors come from:
   - **Composition**; almost limitless compositional permutations and combinations are possible. One single manufacturer in a western country alone has about 1,00,000 formulations.
   - **Raw materials ingredients**; raw materials come from different areas. They contain varied amounts of ingredients. They create variations in the final composition of the manufactured glass. The raw materials even from the same source are not homogeneous. There are compositional variations from one batch to another.
   - **Trace impurities** vary from place to place and from one batch to another.
   - **The manufacturing processes**; they introduce variations due to high temperature, high viscosity and the corrosive action of the melt.
   - **Imperfect mixing of the raw materials**
   - **Non-uniform cooling of the glass;** it inducts stress in certain parts of the glass.
   - **Trace elemental profiles;** of the impurities in the glass are different in different glass. They individualise the source of the evidentiary glass trace.
3. The evidence is stable: it can be collected and examined even after long time.
4. The evidence often remains unnoticed by the culprit especially when he picks up tiny particles on his clothing or in the welt/soles of his shoes or even on his person (hair and, skin, nail). It can link the culprit with the crime.
5. It is not easily contaminated.

17.12.2 Nature

Glass is an inorganic product of fusion cooled to a solid state, without crystallisation. Ii is also called a *super-cooled liquid*. It contains a variety of oxides, which are categorised as formers and modifier. Some oxides act as both formers and modifiers.

Table 17.3

Formers and Modifiers

Formers	Modifiers	Formers/Modifiers (intermediates)
SiO_2, B_2O_3, GeO_2	Li_2O, Na_2O, K_2O	Al_2O_3, PbO, Sb_2O_3
P_2O_5, V_2O_3, As_2O_3	CaO, MgO, BaO	ZnO, TiO_2, BeO

Chemically, ordinary glass is mostly sodium-calcium-silicate. Heat-resistant glass (e.g., borosil) contains about eighty per cent silica and some boron oxide. Optical glass contains a comparatively larger amount of lead and barium. Coloured glass contains oxides of various metals known to give coloured compounds. Sunglass contains rare earths. The compositions of some of the common types of glass are given in the table below. They are representative only. The exact compositions vary with the various manufacturers.

Table 17.4

Composition of Common Glass

(In Percentages)

Glass	SiO_2	Na_2O	K_2O	CaO	MgO	BaO	B_2O_3	Al_2O_3	PbO
Window	71-73	12-15	–	8-10	1-4	1-4	–	0.5-1.5	–
Plate	71-73	12-14	–	10-12	1-4	–	–	0.5-1.5	–
Bottle	70-74	13-16	–	10-13	–	0.5	–	0-2.5	–
Optical	35	–	7	–	–	–	–	–	58
Borosil	80	4	0.5	–	–	–	13	2	–

Certain materials are specially added to give special effect, especially colour to the glass. The common materials are listed below:

Table 17.5

Elements for Special Effect

Element	Arsenic	Titanium	Chromium	Cobalt	Sulphur + Iron
Effect	De-colourisation	Removes air bubble	Green colour	Blue colour	Brown colour

17.12.3 Location

Glass evidence is available at the scene, with the culprit, with the victim, in the vehicle or *en route*. Minute particles of glass may be so placed that unless proper care is taken the evidence may remain unnoticed and un-utilised. The glass evidence is collected in the same way as the other microtraces or the gross evidence, as the case may be.

The following are searched specially:

1. **Clothes, shoes and hair of the suspect**; tiny glass pieces may be embedded in the soles of the shoes.
2. **The upholstery of the vehicle**
3. **The victim(s)**; if bottles have been used as weapon(s), they are likely to carry glass particles in the wounds on his person and on his clothes.

17.12.4 Evaluation

The following evaluations are done to identify and compare glass:

17.12.4.1 Colour

Colour of the glass may permit easy elimination of a large number of suspect samples of glass.

17.12.4.2 Fluorescence

Fluorescence of glass under ultraviolet rays may sometimes permit identification or elimination of the given samples. Some varieties of glasses contain uranium oxide. They give characteristic fluorescence.

17.12.4.3 Measurement

Thickness, curvature, shape or pattern on the pieces may permit the elimination of a large number of samples.

17.12.4.4 Fusion

Fusion temperature of a glass is useful property to characterise glass. However, it needs larger quantities of the clue material.

17.12.4.5 Specific Gravity

Specific gravity of glass varies not only from one batch to another but it also varies in the same batch, because, in the manufacture of glass it is not possible to mix up the various constituents thoroughly due to high viscosity of the molten mass. Some of the constituents get evaporated from the molten mass near the surface only. Besides, the molten glass dissolves some material from the container. Hence, there are variations in a glass of the same batch even. Specific Gravity along with Refractive Index and Bi-refringence is highly useful to discriminate glass.

Specific gravity is measured by the following techniques:

- **Floatation method;** the glass fragment is placed in liquids of decreasing densities. The liquid in which it neither sinks nor floats has the same density as that of the glass fragment.

  In actual practice, a mixture of a heavier and a lighter liquid is employed. The technique is called the floatation method.

- **Density gradient columns**; they are convenient and sensitive for the determination and comparison of densities of glass.

  Two or more density gradient columns are prepared from two liquids, one heavier and the other lighter than the glass. The columns show a gradual increase in density from top to bottom of the tube.

  Questioned and started glass samples are put in the two similar columns. If they settle down at the same level, the common source of origin is a high probability. Absolute density can be ascertained with the help of calibrated glass beads.

17.12.4.6 Refractive Index

Like density, the refractive index is a very useful property in the identification of glass. Two methods are commonly employed for the determination of refractive index.

- **Immersion method:** the glass fragment is placed in various liquids of varying refractive index and its non-visibility is observed under a microscope. The liquid in which it is indistinguishable has the same refractive index as the glass piece.

  In practice a mixture of two miscible liquids (one with higher and the other with lower refractive index) is used, one of them being added gradually until the glass in the liquid mixture becomes invisible. The measurement of the refractive index of the mixture gives the refractive index of the glass.

- **Hot stage method**: it is a modification of the technique. Here a liquid of higher refractive index is chosen and the glass piece is immersed in it. It is then gradually heated on the hot stage of a microscope. The temperature at which the glass piece becomes invisible is noted. The refractive index of the liquid at that temperature gives the refractive index of the glass piece.

  The refractive indices of the liquid at various temperatures are available in the pre-calibrated graph.

  Usually monochromatic light (sodium light) is used to observe the glass in the liquid under the microscope.

17.12.4.7 Dispersivity

Glass shows different dispersions to different wavelengths. Two wavelengths from the two ends and one from the central region of the visible light spectrum are chosen to study this property.

Differences in refractive indices with different wavelengths give dispersivity of the glass.

17.12.4.8 Spectrographic Analysis

Glass, in addition to common constituents, contains traces of elements that vary not only from batch to batch but they vary even in the same batch. A spectrograph is used to identify the trace elements.

17.12.4.9 Neutron Activation Analysis

Neutron Activation Analysis is a highly sensitive technique. It has not become a routine analytical technique in forensic work because it needs an atomic reactor for the analysis. However, it has great potentialities for identification and estimation of traces of various elements in glass to give trace elemental profiles. Corresponding profiles of the crime and the standard samples indicate a common source.

17.12.4.10 Mechanical Fit

If glass pieces are involved, a mechanical fit is tried. If a mechanical fit is achieved, the identity of the common source is established beyond doubt. Even one millimetre long mechanical fit, of crime and specimen pieces of glass, establishes the common source of origin.

The above techniques provide an excellent mode of analyses. However, the commonly used techniques used in most of the cases are:

1. Dispersion
2. Refractive Index
3. Density

If the above evaluations fail to give satisfactory results, other techniques are used.

Microtraces are invisible and inconspicuous visiting cards of the culprit. They are available in all crimes. They provide dependable evidence most of the times. They are to be used increasingly in the coming times.

Fig. 17.5
Infinite variations in colour Shade

17.12.5 What is paint?

Paints are usually coating materials, mostly in liquid form. But they are also used in aerosol and powder forms. When applied to surfaces, they stick to them. On drying, they harden to form a thin film coating on the surfaces. The thin film performs two main functions. Firstly, it protects the surface from oxidation, corrosion and secondly, it improves the aesthetic values by imparting pleasing colour and texture.

17.12.6 Nature

There is a large variety of paints in the market. Most of the paints contain some pigment or colouring agent; some filler and a solvent (called vehicle) in which they are mixed, suspended or dissolved. The nature and quantities of the pigment, fillers and the vehicles differentiate them. The presence of trace impurities in the paints smears or powdery particles make them individualistic. Quantities involved are small and almost invisible.

The paint is composed of different chemicals substances, natural or synthetic, which are classified into the following basic categories:

- **Vehicles;** they solvents (fluids) and take the paint material to the surface, being painted.
- **Pigments;** they are solid materials added to impart colour to the paints. Some of them are anticorrosion or luminescent materials.
- **Binders;** they are a polymer and hold the paint ingredients together.
- **Fillers;** they are material which provide 'body' to the paints and improve their physical/mechanical/chemical properties.
- **Thinners;** these material are used to lower the viscosity of the paint to the desired extent for better application to the surface in question.
- **Additives;** they are chemical compounds, added in small amounts, to improve the processing of painting (for example wetting agents, film-formation promoters)
- **Hardeners;** they are chemicals, which react with the polymers/resins to hasten the processing of drying/hardening of the applied paint.
- **Catalyst;** they promote/accelerate drying processes of the paints.

17.12.7 Evidentiary clues

Paint, as evidence, is met with mostly in road accidents. One may also come across paint in burglaries and in offence against a person where the struggle has taken place.

17.12.8 Location

The investigating officer locates and collects. He follows the drill and the general instructions given for the trace evidence:

1. Whenever possible, he collects the article bearing the paint smear and sends it to the laboratory.
2. He locates the possible source(s) of the origin of the smear and collects specimen smears and paint from that source.
3. He checks all the likely sources of crime paint from where the culprit/victim/vehicle, could pick up to collect specimens from the places close to those sites.
4. He tries to locate the site from the paint flake has come; if the incrimination paint is in the form of a flake. He safeguards the site for assessing it for later mechanical fit.

17.12.9 Collection

In the collection of paint evidence, the IO sticks to the fundamentals: He:

1. Fixes the site from where the evidence is collected (photographs, sketches, textual description).
2. Ensures its identity/integrity/authenticity and intact chain of passion.
3. Arranges witnesses to the collection.
4. He packs the evidence in pilfer-proof packages.
5. Collects specimen in the corresponding mode to the questioned sample. For example, if the is questioned paint is a streak only, the specimen is from the top layer only. If evidentiary clue is a paint flake He collects similar paint flake(s) from the place, as close to the original site as possible.
6. Safeguard the shape of the paint flake from damage.
7. Seizes the source of the flake, for ultimate linkage.

17.12.10 Evaluations

1. Examination and comparison of evidential/sample paints find out if the paints have come from the common source.
2. In some cases, it is possible to fix a flake in a jigsaw fit at the site of its dislodgement. Such fit establishes the source of origin.
3. In some cases, paint layers help. If there are a number of layers in both the questioned and the sample paint flakes, which correspond in colour, composition, thickness, and sequence, the identity of the common source is established.
4. In other cases, the evaluation and comparison of the following feature help:
    - Colour
    - Density

- Fluorescence
- Solvent action
- Striations on the paints flakes
- Chemical composition and trace elemental profiles

The main mode of identification and comparison of paint are to identify (and quantify) chemical constituents of paints, both of organic and inorganic origin. If there is a preponderance of common components in the disputed and standard samples, common source is indicated.

The common techniques, in use, are:

1. Pyrolytic Gas Chromatography
2. Scanning Electron Microscopy
3. Infra-Red Spectrometry
4. GC-MS

17.12.11 Possibilities

With the data obtained through the above examinations, it is possible to answer the following questions:

1. Does the victim carry paint on his person, clothes, or on the vehicle from the suspected source?
2. Has the disputed (crime) paint (powder, flake, streak, or smear) on the victim/his vehicle/object come from the given source (from the culprit's vehicle, in a hit–and–run case!)?
3. What was the original paint colour on the stolen vehicle?
4. Was the vehicle repainted, recently?
5. Do the wood shavings on the clothes or the shoes of the suspect bear paint? If so, is the paint similar to that of suspected source?
6. Does the paint bear fingerprints, cloth marks or tool marks? Are these marks from the suspected source?
7. Are the paint particles, on the tool of the suspect, from the suspected source?

17.13 FINGERNAIL SCRAPINGS

17.13.1 Importance

In India, fingernail scrapings have not received the attention they deserve in spite of the fact that can provide significant linking or corroboratory evidence especially in offences against persons and scuffles. They are likely to play an important role in the coming times in the face of dwindling traditional evidence.

Fingernails pick up, accumulate and retain debris from the source materials with which they come in close contact. The nails retain the debris for a long time. It is not easily removed as protruding nails protect the materials. Besides, most of the criminals (and the IOs) do not know its importance of fingernail and fail to collect the same.

The fingernail scrapings provide useful information in the following situations:

1. **Murder cases:** If the culprit has smeared his hands in blood, some of it will seep into the fingernails crevices and remains there even after washing hands.

2. **Rape cases:** The rapist often scratches the body parts (face, breast, genitals) of the victim. As a result, the hands are smeared with the body materials, which also get deposited in the fingernail crevices. Likewise, if the victim has resisted the attempts of the rapist, he/she may scratch his body and thus carry the body materials from the culprit in his/her nails crevices.
3. **The culprit** may handle liquids or powders at the scene while committing crimes. These materials in small amounts get lodged in the nail crevices.
4. **Drug addicts:** They handle drug frequently. The drugs seep into their nail crevices unnoticeably and thus tag them as drug addict/peddlers.
5. **Professional dust and stains** are retained in the fingernail crevices. They help to identify criminals and corpses.

17.13.2 Investigator's Role

The investigating officer while collecting the fingernail scrapings observes the following guidelines:

1. He collects the scrapings in separate clean paper folds/bags from different fingers, separately and put them in small plastic bags, after drying
2. He uses a blunt toothpick for scraping
3. He does not pair nails to collect the finger nail evidence
4. He does not use a metallic needle to scrape the debris from the nail crevices.
5. He takes the needed precautions to ensure identity/authenticity/integrity and intact chain of custody of the evidence in the collection process of traces from the fingernails

17.13.3 Possibilities

Fingernail scrapings can provide an answer to the following questions:

1. **Has the culprit scratched the victim (or vice versa)?** The presence of skin, blood and hair, from the scratched person, in the nail scrapings, can inter-link the culprit and the victim.
2. **Was the suspect at the scene?** Certain materials, which he may have handled at the scene, may get into the nail crevices. The nail scrapes may link the suspect with the scene. Absence of the materials does not exclude the suspect.
3. **What was the profession of the subject**? Characteristic nail scrapes may indicate the profession of the subject.
4. **Is the suspect a drug addict/Drug dealer?** The presence of drug traces in the nails scrapings is a fair indicator that the person is involved with drugs. Absence of drug does not prove that the subject is not involved.

17.14 MISCELLANEOUS

17.14.1 Erased Numbers and Designs

Metallic articles (Firearms, Vehicles) of value are often marked with serial numbers, trademarks, and maker's name. The marking is done in a number of ways- casting, stamping, engraving, etching and printing. When a thief steals such a marked item, he mutilates, modifies or removes the numbers/designs/other identifying information to hide the true identity of the entity. If the investigating officer can find out the original numbers and designs, he can establish theft.

Besides, he can trace the original owner. Thus, finding of erased numbers and designs is an important help to the investigating officer.

Erased numbers and designs are also found on articles of wood, plastics. It is possible to resuscitate the numbers and designs in some cases.

The process of restoring number is called resuscitation. All Forensic Laboratories undertake the work. The entity should be sent to the departmental laboratory.

17.14.2 Laundry Marks

Laundrymen put identification marks on the garments sent to them. Usually, the identification marks, the place where the marks are put and the marking media vary with different establishments. The laundry marks, thus, can indicate the laundry or the dry cleaner's shop. The record with the laundry people often indicates the names and addresses of the individuals/ owners who have requisitioned the laundry services. Thus, garments left at the scene of a crime can lead the investigating officer to the criminal.

Sometimes, laundry marks on the clothes of an unidentified corps help to identify the deceased.

The identity of the owner of the stolen garments carrying laundry marks can also be established.

Laundry marks may be visible or invisible. It is always advisable to send the clothes to the laboratory specialist, to find out the correct laundry mark. He can decipher even invisible or faded marks.

In India, no organisations keep records of the laundry marks, perhaps due to ignorance about their utility. It is high time NCRB (National Crime Record Bureau) start compiling the data on the pattern of the National file of laundry marks. FBI, USA.

17.14.3 Jeweller's Marks

Jewellers and watchmakers of repute put mark on the jewellery or watches they sell or repair. The marks are in the form of tiny engravings, which can be seen only through a magnifying lens. A jeweler or watchmaker would, ordinarily, identify his mark and may indicate the customer.

17.14.4 Microorganism

Microorganisms are microscopic life invisible to the naked eyes. It grows profusely on organic matter, under congenial environment. Their nature depends upon the sub-strata, the availability of air, light, humidity and temperature. They differ widely even in adjoining areas. They form useful clues. The culprit may leave or pick them up without being aware of them.

Microorganism evidence can prove extremely useful where traces of organic matter (they contain microorganism) have been exchanged by the culprit, his transport or his weapon of offence, with the victim, the scene or the surrounding articles *inter se*. They can sometimes provide decisive evidence to link the criminal with the crime.

17.14.5 Tobacco

Smoking is a widespread habit. Thus, cigar, cigarettes, bidis, their stubs, ash or tobacco sometimes figure as evidentiary clues. In addition, saliva on the stubs and burnt matchsticks at the scene are also important clues when the criminal had smoked at the crime scene and left ash, stubs or matchstick at the scene. The traces of the pipe tobacco, snuff, Zarda (chewing tobacco) left at the crime scene can, likewise, and be an important evidentiary clue.

Some criminals smoke Cannabis Ganja or Hashish in cigarettes alone or mixed with tobacco. The residuals of the smoked material not only help to identify the criminal but they also indicate that the criminal is a drug addict. The latter is prohibited drugs. The IO process the evidence.

The evaluation of tobacco evidence can answer the following questions:

1. Is the crime tobacco sample similar to the one recovered from the culprit?
2. Is the crime matchstick from the matchbook of the suspect?
3. Are the cigarette/bidi stubs/wrapper found at the scene of the same brand as the suspect smoke?
4. Is the cigarette stub, recovered from the scene, similar to the one seized from the suspect?
5. Is the **spittle** found at the scene of the suspect?
6. Is the tobacco ash at the scene from the tobacco of the suspect?
7. Do the cigarettes seized from the suspect contain cannabis or its products?
8. What is the source of origin of the cannabis sized from the suspect?
9. Is the saliva on the stubs of the cigar/cigarette/bidi of the suspect?

MICRO EVIDENCE GALORE

(A classic example of trace evidence)

In a murder case of a female the clothes of the culprit and the orange blanket recovered from him were examined for trace evidence. 30 categories of trace evidence, including hair, washed sand, white and green paint chips; charcoal, plaster, wood chips and sawdust were found and introduced in the court. These fragments of wood chips, paint and fibers were linked to culprit's 25 separate items or locations, including her body, her clothing, workshop, and the blue pickup....

The trace evidence: hair, fibers, metal fragments, paint chips, wood chips, charcoal, and plaster were analyzed. The blood was typed using electrophoresis. The presence of seminal fluid was detected using an acid phosphatase test. Hair and fiber comparisons were done with a comparison microscope. Paint chips and metal fragments were tested with infrared spectroscopy, x-ray fluorescent spectroscopy and a micro spectrophotometer

,.

The trace evidence linked the culprit to the crime and brought him the highest punishment. (CH)

17.15 ADDITIONAL READING

1. Houck , Max. 2003. *Trace Evidence Analysis,* Academic Press.
2. Blackledge, Robert D. 2007. *Forensic Analysis on the Cutting Edge: New Methods for Trace Evidence Analysis.* Online.

CHAPTER 18

HAIRS

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Fig. 18.1

18.1 NATURE

Hairs grow on most of the limbs of human beings and animals. Mammalian species (those who suckle their young ones) have two types of hair:

1. Long and stiff hair, and
2. Fine fuzzy (woolly) hair

Hair growth starts from the hair centres called follicles. They are fine rods in shape. They may or may not have fine tips. Some hair having fine tips in the start later acquires the diameter of the main part of the hair.

Hair grows to certain lengths, and then they fall off unless they are clipped/cut. New hair may replace the fallen ones. The head and beard hair grows about 0.4 mm per day. The growth rate of hair from other parts of the body is less.

Chemically hair is made of proteins, mostly of Keratin. Hair pigments usually consist of melanin proteins. Other compounds in the hair are uric acid, cholesterol, vitamins. Some elements like arsenic, lead, iron, and silicon are also present in the hair. These elements form the basis for the Neutron Activation Analysis of hair. Hairs help to detect Chronic Lead/ Arsenic.

External contamination of hair with oily substances, dust, and dirt is common.

Morphologically, a hair consists of root, shaft and tip, which have characteristic shapes and structures. Pigment distribution and the presence of air bubbles (vacuoles) in the hair give additional points for characterisation.

Fig. 18.2
Normal root of hair

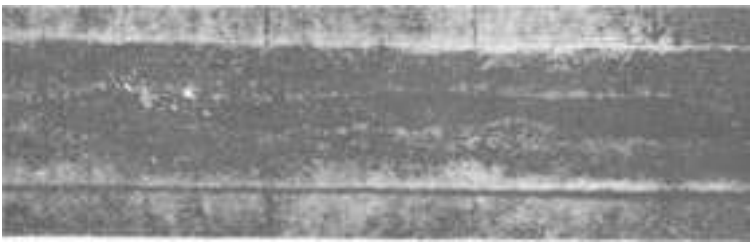

Fig. 18.3
Usual structure of human hair
1. Medulla. 2. Cortex 3. Cuticles 4. Pigment

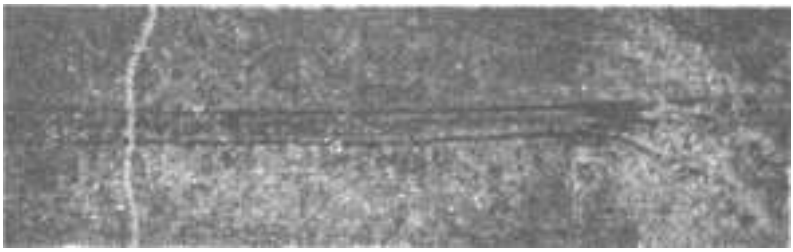

Fig. 18.4
Frayed uncut tip of a human hair

The structure of hair is characteristic in another way. It has three parts: the central part (called medulla), the outer part (called cuticle), and the part in between the two parts (called cortex). The nature of medulla and its diameter concerning the total diameter of the hair are highly characteristic and often indicate the species of the source of the hair. Further, the structure of cuticles, like the scales of a fish or shingles of a roof, is also characteristic of the origin. Physical properties of hair like refractive index, birefringence, and the density differ not only from species to species but they also vary from one individual to another.

A human being sheds about ten hairs a day. The falling rate increases under emotional stress, like that in serious crime situations of rape or murder.

The hair undergoes changes. These changes are conditioned by food intake, habits, climatic conditions, environment, emotions, and age. External treatment of hair: bleaching, dyeing, cutting, and combing also affect.

18.2 IMPORTANCE

Mutual transfer of hair, due to contact, is a classic example of Locard's principle of exchange of traces. Hair, if properly searched, are found in most of the criminal cases. It is one of the earliest types of physical evidence, which was considered/collected/evaluated and utilised in forensics. Individualisation of the hair, *vis-a-vis* its source, had been, however, eluding the scientist up until recently. The advent of DNA profiling has changed the scenario completely. Nuclear DNA (nDNA), available in the live roots of the hair, can individualise the hair owner decisively. Mitochondrial DNA (mDNA or mtDNA) links the individual with maternal relatives.

> *In a case, a young man was standing in his front yard talking to his friends when a car swerved off the road, struck the young man, and killed him. From the description given by the victim's friends, the police seized a suspect car with a damaged fender and broken head light. The police sent the fender, pieces of the head light, the victim's clothing and hair samples to the Forensic Science laboratory. The evidence found included:*
>
> 1. ***A fabric impression on the fender;*** *It was consistent with test impression of the victim's trousers.*
> 2. ***Numerous fibres;*** *corresponding to the victim's trouser, were found embedded in the paint in the area of the fabric impression.*
> 3. ***Several head hair****, microscopically matching with the victim's head hair, was found wedged under the metal trim on the fender.*
> 4. ***Particles of paints*** *like that on the fender and glass particles consistent with headlight glass from the car were recovered from the victim's clothing.*
>
> *Faced with the evidence, the defendant entered a plea of guilty. (CH)*

The identification of hair provided mainly corroboratory evidence, until recently. In some cases, however, exclusion of some suspects was possible from the examination/comparison of

the questioned/standard specimen hair. Only in rare cases, the presence of some individual dye, contamination, some extraordinary defect or disease in the hair could permit individualization of the source. The new technologies have now changed the scenario. Hair can provide the definite linkage of the hair with its source, making hair an important piece of physical evidence. It helps to:

1. Establish the presence of culprit(s)/victim at the crime scene/in the crime vehicle.
2. Establish contact of the culprit with the victim/crime scene from the transference/exchange of hair.
3. Show the route of ingress/egress if some strands of hair are retained at the points of entry/exit.
4. Identify the weapon of offence if a hair is found sticking to the weapon.
5. Link the vehicle used in the commission of a crime with the culprit/victim.
6. Establish the ownership of the articles left at the scene.
7. Detect slow poisoning and determine the nature, quantity and the period over which the poison had been administered.
8. Identify alcoholics.
9. Identify the drug addict and the drug he has consumed.

In the case of Napoleon' death, the cause of death was found to be slow Arsenic poisoning. His hair contained 14 times the normal quantity of the poison. The nature and quantity of the poison was determined after about 140 years, from the analysis of his hair. (CH)

Hair evidence is available in many crimes. Every human being sheds hair, normally about 10 hairs a day. The falling rate increases under emotional stress, like that in serious crime situations of rape or murder. The hairs are, therefore, likely to fall at the scene. They provide an important link in murders, sexual assaults, road accidents, rapes, abortions, bestiality, housebreaking, maiming, poaching, worrying and thefts of furs and animals. Identification of hair through DNA profiling provides definite acceptable identification evidence.

In an interesting case, a culprit stabbed a person at a bus stand, just before boarded a running bus. He placed the knife on the bus seat and got down at the next bus stop. The police recovered the weapon from the seat. They found that the knife was smeared with blood and there was some hair sticking to it. The blood matched with that of the victim and the hair matched with the hair of the gloves of the suspect. The hair evidence linked the criminal with the victim. (CH)

The hair is almost invisible. It goes unnoticed many times. The culprit does not bother about it. The investigating officer should locate/collect and use it in his investigations.

18.3 PROBLEMS/POSSIBILITIES

The evaluation of hair evidence provides answers to many questions including the following:

1. Is the given fibre a hair?
2. Is the hair of human or of animal origin?
3. Does the hair come from a male or a female?
4. From which part of the body has the hair in question come?
5. What is the age of the individual to whom the hair belongs?
6. Do the given two sets of hair come from the common source?
7. What are the species of animal to which the hair in question belong?

8. Was the questioned haircut, fallen or pulled out?
9. Has the hair been dyed or bleached? If so, can the dye be identified?
10. Is the hair of the subject cut, if so, when were they cut last?
11. Do the chemical tests of hair indicate chronic poisoning?
12. Does the hair contain traces of drugs or their metabolites?
13. How long has he been taking the drug?
14 . What is the nature of the drug?
15. Is the hair contaminated? If so, what is the nature of the contaminant?
16. Is the hair suitable for microscopic comparison?
17. Is the hair suitable for DNA analysis?
18. Is the hair (strand of hair) characteristic of a certain racial group?
19. Are the hair damaged by the weapon of offence or fall?
20. Does the given hair suffer from disease?
21. Are the hairs from one or more than one person?

In a murder case, it was alleged that certain hair found in the hand of the deceased were pulled out from the culprit in the struggle. When the hair was examined, no root could be discovered. Instead, they bore cut marks. It was opined that the hair has not been pulled out as alleged. (CH)

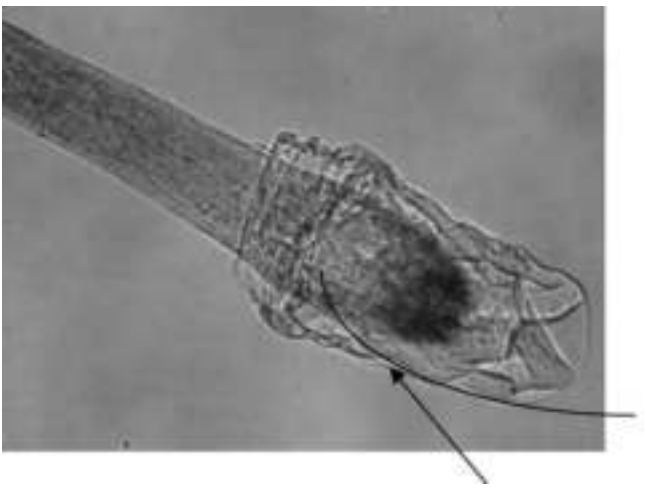

Fig. 18.5
Hair with root

18.4 LOCATION

The location of hair evidence is a difficult task because of their dimensions, quantity and colour. The search is tedious and time consuming. A strong torchlight and a magnifying glass prove handy.

The following are the usual sources of the hair evidence. They are thoroughly searched:

18.4.1 Scene of Occurrence

The whole scene of occurrence is thoroughly searched for hair. Particular attention is paid to:

1. the furniture where the criminal might have rested;
2. the bed where he might have lain,
3. the carpet where some hair might have fallen in the scuffle,
4. the draperies where the culprit might have wiped his hands and face,
5. the discarded pieces of cloth, garment or paper,
6. the articles he might have handled in the commission of a crime such as safe, wardrobes, trunks and suitcases,
7. the culprit might have combed or brushed his hair at the house of the victim. The comb or the brush would carry hair evidence.

The culprit might have abandoned some articles at the scene such as headgear, gloves, and the weapon of offence, shoes, clothing, and the like. They are likely to carry hair evidence.

18.4.2 Culprit and Victim

The culprit and the victim exchange hair in many situations:

1. **Scuffle;** the victim might have grappled with the culprit and come in close contact with him in some other way. They, thus, often exchange hair. The victim may carry hair in her/his hand.
2. **Sexual assaults;** in sexual assaults/acts, the culprit and the victim are likely to exchange hair. They may be on his or her sexual parts or clothes.
3. **Fights;** if the victim has hit the accused with shoes or something else the same may carry hair. If any of the combatants had struck/pushed the head violently against a hard surface the head of the other, hair may be deposited at the struck site.

18.4.3 Vehicles

If a vehicle has been used to carry the victim, the victim is likely to leave hair in the vehicle. Likewise, if the culprit has used a vehicle to get away from or to reach the scene, he is likely to leave hair in the vehicle.

If the vehicle is the crime scene itself (rape, assault, murder) the vehicle is likely to carry a rich harvest of hair.

18.4.4 Weapon of Offence

If a weapon like a sword, stick or stone has been used to attack a victim, the weapon is likely to carry hair from the site which has been struck. The hair is often found sticking to the weapon in such cases.

18.4.5 Other Sources

Other likely sources for hair evidence are:

- Hiding places of the culprits
- Bathrooms, if the subject has washed his face/head/hands
- Disposal site of the discarded clothes; the clothes are likely to carry hair

18.5 COLLECTION

Collection of hair involves collection of incriminating hair and sample hair.

18.5.1 Crime (incriminating) Hair

As already mentioned, the incriminating hair is found in a variety of sites/situations. They are minute objects, not easily visible. Bright light and a hand magnifier are used for location and collection. Hairs, collected from different places, are put in separate envelopes. The place of collection and identification data is put thereon. The envelopes for one case, are then enclosed in bigger envelopes and sealed.

The collection methods are:

1. **Hand picking;** the hair is picked up with hands, placed in a paper fold, which carries identification data. The paper fold is then placed in paper/plastic envelope. Some IOs record the identification data on the envelope.
2. **Tweezers picking;** the hair found attached to immovable articles are picked up with tweezers and processed as in (1). In hand and tweezers picking infrared or laser are sometimes used to enhance the ability to the visibility of the hair.
3. **Article collection;** if an article like clothing or weapon of offence is suspected to carry hair, the article itself is placed in a clean envelope and sent to the laboratory.
4. **Brushing;** cloth objects like garments, bedding, upholstery, **are brushed on to a white paper sheet/evidence examination table and the dislodged micro traces are examined and hair is picked up**.
5. **Combing;** it is used to collect cross-transferred hair in close contact, especially to collect pubic hair in sexual offences. Pubic hair areas of both the suspect (culprit) and the victim are combed to comb out the loose transferred hair.
6. **Tape lifting;** the use of adhesive tape to lift hair from suspected articles/entities is often convenient. Furniture, beds, and clothes can be taped easily. A convenient length of tape is unfolded and pressed against the suspected surface. The tape picks up hair talon with other loose traces (fibres, dust, and debris). The material lifted on the tape is protected by sandwiching it by folding fresh tape over the used tape.

   Sheet or square lifters are also used in place of lifting tape.

   Stereomicroscopic examination of the tape indicates the location of hair. It is recovered from the tape with a drop of xylene, which dissolves the adhesive and the hair is freed. It is picked up with tweezers. There is little chance of losing the hair using this technique.

   The tape fails to lift hair (and other evidence) when hair is lodged in some crevice (or covered by some material) and it does not come in contact with the tape.
7. **Vacuuming;** it is a road roller technique to collect hair (and other such evidence) from large areas like the inside of a car, furniture or floor is to be searched for hair. The vacuum cleaner is modified/adapted for the collection of hair (and dust, dirt and the like). Microtraces containing hair from different items and places is collected separately by using different filter discs for different areas. They are kept in the folds of a paper and properly labelled. Or, they are kept in transparent petri dishes in laboratories. The plastic container of suitable size can be used for preservation of the evidence.

The technique is useful in sexual offences committed in cars, on carpeted floors, on sofas or in beds; or, in those cases where a large area is involved in the struggle.

8. **Solvent action;** if the hair is found stuck in mud, blood, paint or semen stains, they are taken out after loosening them by suitable solvent action.

18.5.2 Standard Sample Hair

Sample hair is collected from the victim, the accused, and anyone who may have left hair at the crime scene, for comparison purposes. About 25-specimen (minimum) hair from each source is adequate for comparison. However, it is better to send about 100 hairs from each source, if available.

The collection is done in the following ways:

18.5.3 Combing or Brushing

Combing or brushing is done with a stiff brush; it is the best way to collect the sample hair of a person. Representative samples from various parts of the body (crown, temple, nape, eyebrows, eyelashes, moustaches, beard, sexual, and other parts) are collected and packed separately. Combing or brushing gives hair of all types, such as hair with roots, broken hair, and hair ready to fall. They are also of all shades and have varying characteristics. They are usually the best representative hair.

18.5.4 Pulling

Pulled out hair is the best sample hair. Samples from animals and dead persons are invariably pulled out. Some living persons may not allow pulling out their hair.

Pulled out hair sample is necessary, where the damaging hair is allegedly pulled out. When the number of hair being pulled out is only one or two, the pulling out process does not hurt much.

18.5.5 Clipping

Collection of hair sample by clipping is the least satisfactory method and should be adopted only when other methods cannot be applied or fail. The hair is clipped as close as possible to the skin.

18.5.6 Precautions

In addition to observing the usual precautions in handling microtraces, the following specific precautions pertaining to the collection of hair are observed:

1. The investigating officer (IO) does not clean the collected hair. He forwards them to the laboratory in the same condition (the original condition) in which he seized the hair. However, if they are wet, smeared with wet blood, semen or other fluids, they are dried before packing.
2. The IO sends all the collected incriminating hair.
3. He invariably collects sample hair of the victim in fatal/non-fatal cases from the likely source on the body.
4. He invariably collects sample hair from the suspect and the victim in rape cases.
5. He specifies the site of origin of the hair samples collected from various parts of the body on the paper/envelope used for collection.

He collects about twenty-five (preferably one hundred) sample hair whenever possible.

18.6 EVALUATIONS

The hair is examined visually and microscopically. Microtomy is used for cross-sectional studies. Appropriate instruments are used to study physical properties: density, refractive index, and birefringence. Neutron activation analysis is helpful in the detection of elemental traces. Briefly, the evaluation methods are:

18.6.1 Visual Examination

Visual examination reveals the colour, length, and general conditions of the hair. It may give an idea of whether the hair has been dyed or not. It also indicates the presence or absence of contaminants and their nature.

Hand magnifier and stereomicroscope extend/supplement/improve the visual examination. They permit a better appreciation of the colour and contaminants of the hair.

18.6.2 Microscopy

The various microscopes used in the study of hair are:

1. Stereomicroscope
2. Compound microscope
3. Phase contrast microscope
4. Comparison Microscope
5. Scanning Electron Microscope (SEM)

The stereomicroscope is used for a preliminary examination of the hair without cleaning or mounting them. It reveals their colour, contamination, and character, whether they are curly, wavy, soft or coarse, whether the ends are frayed or have tips or whether roots are present or not. It is possible to say whether the hairs have been pulled out, cut or fallen. Pulled out hair have live **"bulbs"** and signs of stretching near the bulb. In fallen hair, the root bulbs are emaciated (shrunken).

The detailed microscopic examination of hair is done after cleaning them in the alcohol-ether mixture (or acetone). They are mounted in Canada balsam on a microscopic slide and examined under magnification (400 X). The examination reveals:

1. **Actual colour of the hair;** the contamination, which may be masking the real colour of the hair, is removed in the cleaning process.
2. **Dying/bleaching treatment;** it is the colour of the main shaft with the original colour, found near the root end. This portion bearing the original colour of hair may be long or short depending upon the period elapsed between the dyeing or bleaching and the collection from the head or shedding of the hair.
3. **The body part from which the hair originated;** the head hair is like rods, whereas the hair from eyebrows or eyelashes has pointed tips. The beard hair is somewhat flattened
4. **The morphology of the hair;** it indicates the presence or absence and nature of the medulla and the pigmentation pattern.

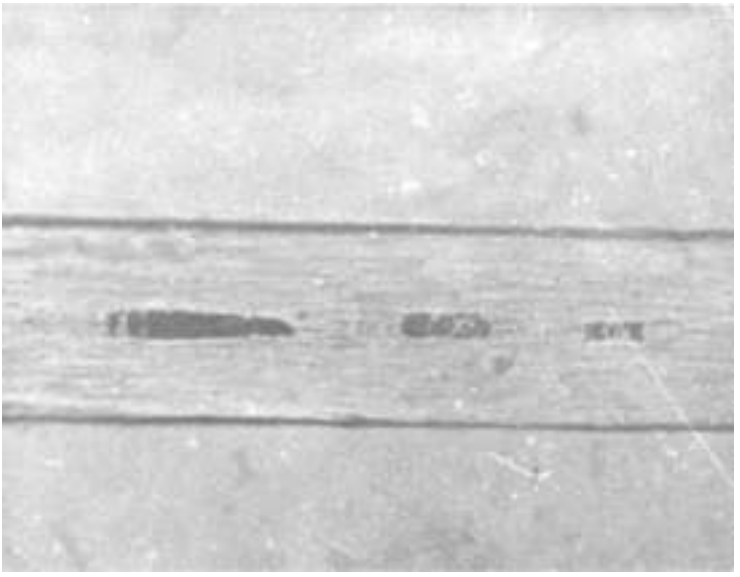

Fig. 18.6
Fragmentary medulla

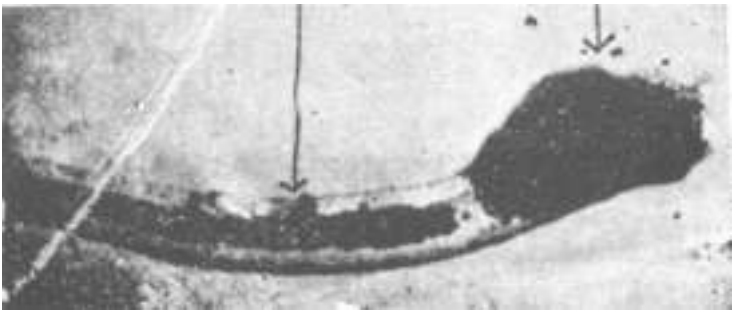

Fig. 18.7
Bending and other change in hair on heating and burning

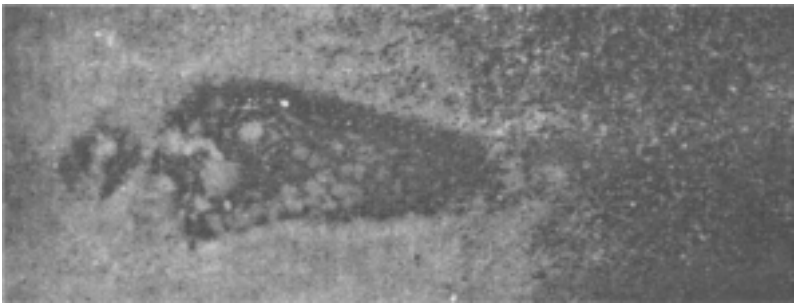

Fig. 18.8
Changes in scale structure of partially burnt hair

5. **The Medullary Index;** the ratio of diameters of the medulla and of the hair, measured at the thickest point, is known as *Medullary Index*. It indicates the species of origin. The medullary index of the human hair is commonly less than 0.3 and in animals; generally, it is more than 0.5.

   The Medullary index varies somewhat in male and female hair and in the hair from different parts of the body. Ordinarily, the medullary index is greater in the woman when hair from the other parts of the body is compared. The male beard hair has greater medullary index than hair from other parts.

   The Medulla may be continuous, fragmentary, or it may be absent in human beings. Hair pigment may mask it sometimes. Bleaching of the hair makes it visible.

6. **Pigment distribution;** it is helpful in the study of species and in the identification of hair of an individual. It is often an important characteristic and permits the elimination of certain suspected sources of hair.

7. **The roots and the ends;** the roots reveal whether the hair has been cut, pulled out, or fallen. The ends reveal whether the hairs have been cut and if so when were they last cut. Freshly cut tips have sharp cut ends/edges. The tips (hair ends) become round over time.

   The possible nature of weapon with which the hair was severed is also revealed at times by the severed edges of the ends. With blunt weapons, the cut end is found frayed and irregular. With sharp edged instruments, the cut ends have sharp edges.

8. **Deformity/disease in the hair**

9. **Vacuoles;** they give characteristic formations in certain species, which are useful in their identifications. They are also known as air bubbles.

10. **Special treatment;** it is revealed by the changes in the hair.

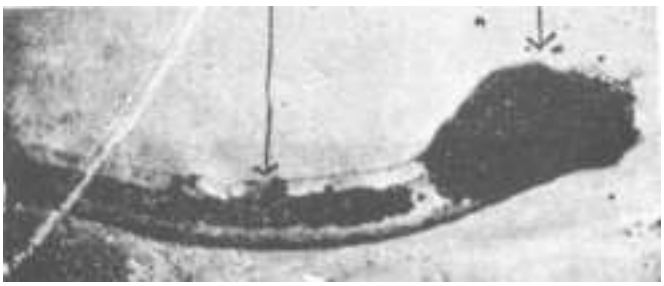

Fig. 18.9
Bending and other change in hair on heating and burning

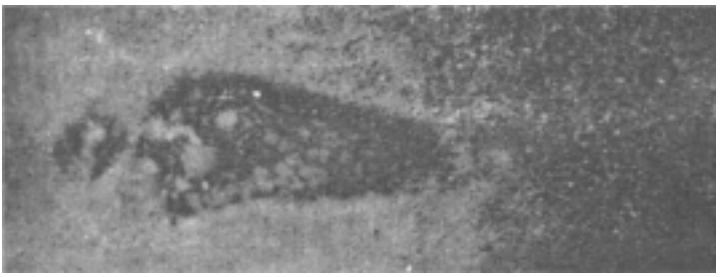

Fig. 18.10
Changes in scale structure of partially burnt hair

18.6.3 Microtomy

A microtome is used to create cross-sections of hair. Clean hair is embedded in hard wax, plastics or flesh. It is sliced into thin disks/circles. The slices are fixed in Canada balsam on a microscope slide, the embedding material removed with a suitable solvent, and the cross-sectional structure of the hair is studied.

Microtomy is helpful in the microscopic study of the cross-section of the hair to determine pigment distribution, medullary shape and medullary index of the hair. In human hair, the pigment is found concentrated near the periphery of the cortex close to cuticles while in animals, pigment concentrations are near the medulla and in the cortex. Cross sectioning also, facilitates the proper study of the shape of the hair and relative sizes of the hair parts: medulla, cortex and the cuticle.

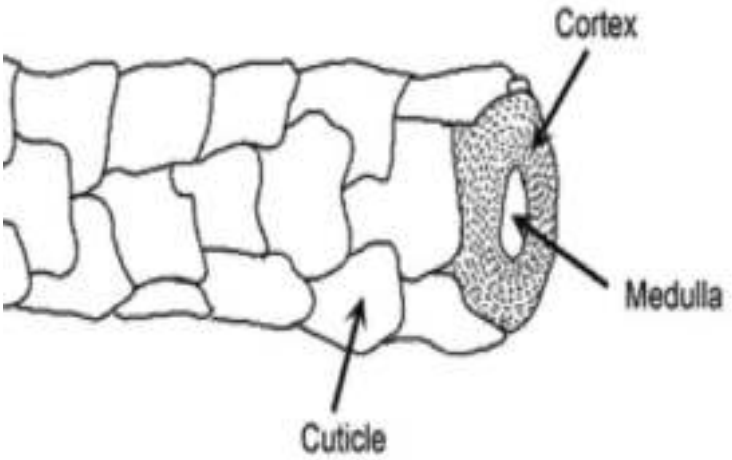

Fig. 18.11
Schematic Cross sectional structure of human hair

18.6.4 Scale Count

The cuticle scales of hair are difficult to study directly under a microscope. The casts of the hair are, therefore, prepared on plastic sheets or in clear fingernail polish. The hair being cast is placed on a plastic sheet slightly stretched, covered with a glass slide and evenly pressed with a weight. It is then warmed with a table (or an infrared) lamp for a suitable length of time. It is cooled. The pattern of the scales is imprinted on the plastic sheet. If the nail polish is used, it is spread over a slide and the hair is fixed over it when it is still wet. When the nail polish has hardened, the hair is removed. The scale pattern is printed in the nail polish. The number of scales per unit length and their shapes and pattern varies with different species and individuals. They, therefore, help to identify the source of the hair.

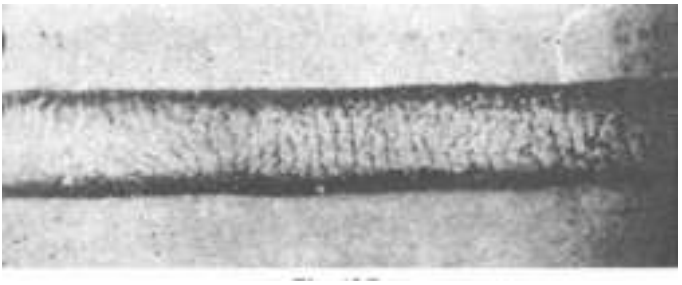

Fig. 18.12
Scales of human hair

18.6.5 Density

Density is an important physical property of hair. Density gradient tube method is used to study and compared the density of hair (and other microtraces). The question and sample hair are placed in the columns of two similarly prepared gradient tubes and allowed to settle. They settle at the levels where the densities of the hair correspond to the liquid mixtures. If the hair settles at the same height in the two columns, a common source is indicated.

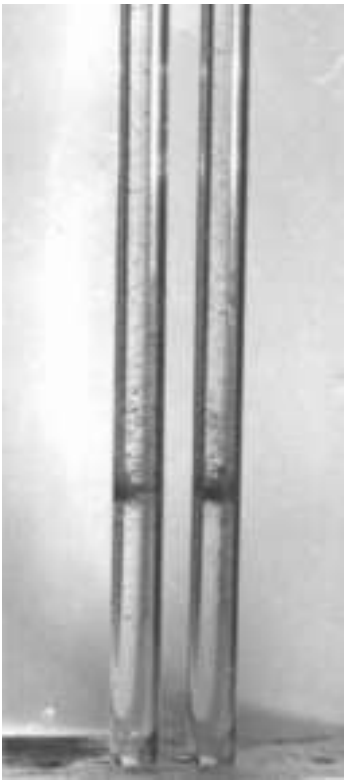

Fig. 18.13
Comparison of densities of incriminating hair and specimen obtained from the suspect

Table 18.1

Human Head Hair Features

1.	Length	Indefinite. It can be short, in millimetre to about 2 metres (in exceptional cases only). Female keep long hair in India.
2.	Diameter	It is 20 to 100 μm. It varies with various individuals.
3.	Colour	Black, Brown, Grey, White.
4.	Tip	Uncut will be tapered, freshly cut have sharp edges, which become increasing rounded with passage of time. The edges may also be frayed and splintered.
5.	Roots	Stretched in pulled hair, round in recently fallen hair, follicular.
6.	Medulla	Continuous, discontinuous fragmentary, absent, invisible.
7.	Cortex	Healthy, damaged, brittle, fibrous, air bubbles present or absent.
8.	Pigment	Distribution of pigment, massive, dense, concentrated at places, size of granules, decolourised or not. Greying of hair.
9.	Cuticles	Thickness, number of layers, scale count.
10.	Scales	Prominent, smooth, serrated, flattened.
11.	Relative densities	Relative densities (specific gravity) inhuman hair varies from 1.3 to 1.4
12.	Miscellaneous	Curly, Wavy, Kinky, Straight, Diseased, Any defect.

Notes:

1. The hair roots with live roots are now being utilised to identify the owner of the hair via nuclear DNA profiling.
2. The hair shaft is being utilised to identify the owner of the hair via mitochondrial DNA profiling.

18.6.6 Refractive Index

Refractive index of hair is determined by Backline method. There are minor variations in the refractive indices of hair of the same individual; the variations are ignored statistically.

Refractive index of hair also gives some idea about the age and sex of the source of origin.

18.6.7 Birefringence

The phenomenon of deviation of light passing through some transparent materials, differently at different angles is called birefringence. The deviations are characteristic of the materials. The hair shows the phenomenon but due to inconsistency in the deviations of different hair of the same person, it has not been used to any appreciable extent to identify or individualise hair.

Other properties such as elasticity, tensile strength, and elongation under stress have been studied in the textile industry. They can be adopted in the evaluation of hair evidence in the criminal investigation.

18.6.8 Neutron Activation Analysis

Many substances, including hair, when bombarded with neutrons in an atomic reactor become radioactive. The induced radioactivity is highly specific of the elements present and can be used

to identify them quantitatively and qualitatively. The technique can determine these elements in very small quantities, which defy analysis with conventional chemical and physical methods.

Carbon, hydrogen, oxygen and nitrogen elements form over 95% of the bulk of the biological samples. They do not interfere in the determination of other trace elements in biological materials in this technique. In the initial stages of hair analysis by this technique, it was hoped that individualisation of hair is within reach. But extended work in the field showed variations in the hair composition of the same individual at the same time and at different times due to diet, climate, contamination, and diseases.

A quantitative and qualitative examination of the element such as arsenic, iron, lead, and silicon, which are present in hair, permit the identification of the possible common source of hair because the composition varies from one individual to another. It does not lead to the individualisation of the person.

The technique is simple in principle. The hair, under examination, is exposed to neutron bombardment. The trace elements in the hair become radioactive. Gamma-rays-spectrometry gives qualitative and quantitative analyses. Comparison of the analyses of the questioned and the standard samples indicates the possible common/different source.

The technique requires an atomic reactor and, therefore, it has not become a routine technique so far in forensics.

18.6.9 Scanning Electron Microscopy

Scanning electron microscopy is playing an increasingly important part in the evaluation of hair structures. The instrument has been utilised particularly for the study of cuticles/scale structures. They are studied with the instrument in both ways, direct or after preparing the casts of the hair.

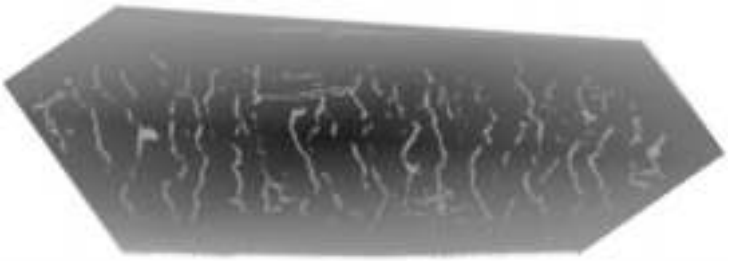

Fig. 18.14
SEM view of scales on human hair

18.7 SPECIFIC PROBLEMS

18.7.1 Species

The species of the source of hair can be identified from morphology, nature of medulla, cortex, cuticle, and pigment distribution. Extensive experience and compiled reference data are needed for such identifications.

18.7.2 Racial Identification

With the intermarriages among the persons of different races, the problem of identification of the racial origin of the person from the hair is becoming increasingly difficult. However, hair studies do provide some guidance.

The main features, which distinguish the hair of the different races, are given below.

Table 18.2

Racial Features of Head Hair

Race	Colour	Diameter (mm)	Special (features)	Section	Cuticle
Caucasoid	even black	70-100	Curly	oval	medium
Mongoloid	dense black clusters	90-120	Straight	round	thick
Negroid	dense auburn	60-90	Straight, wavy (sometime)	flat	nil

18.7.3 DNA Profiling

If the skin, flesh or blood was sticking to the hair root, definite identification of the source person of the hair is made through *n*DNA profiling. However, hair in criminal situations is usually fallen hair. They do not carry sufficient body cell materials and thus fail to provide the *n*DNA profiling. However, the discovery of mitochondrial DNA (*mt*DNA) has changed the scenario. Now, hair can be linked to an individual through mitochondrial DNA though to a limited extent. Mitochondrial DNA is inherited from the mother only. Other maternal relatives also carry the *mt*DNA. Therefore, it suffers from individual specificity. In *mt*DNA, the success rate is about 80%. Both shaft and roots can be used for the extraction and amplification of *mt*DNA and a final comparison of the *mt*DNA profiles. Usually, it is used in conjunction with microscopic examination.

If nuclear material is not available *for n*DNA analysis, *mt*DNA analysis is done in all cases in which identification of the source is desired. It is done after the microscopic examination; as DNA analyses are destructive.

18.7.4 Age

A rough estimate of the age of a person from the hair can be made. In growing children the hair is soft and fine. They become coarser with age. The pigment distribution, refractive index, and density also undergo changes but no definite co-relation between the age and these changes in the hair morphology has been established so far.

18.7.5 Male or Female

It was difficult to say whether the given sample of hair comes from a male or female only a few years ago. However, research in the field has proved fruitful. Identification of the sex via Y-chromosomes analysis, from the hair, is possible in pulled out hair.

18.7.6 Cut, Pulled or Fallen

Microscopic examination of the root ends indicates whether the hair has been pulled out, fallen or cut. Healthy roots indicate pulling out the healthy hair, dried/decimated root bulbs indicate fallen hair and absence of roots indicates cut or broken hair. The shapes of the lower tips indicate whether the hair has been cut. An idea of the duration of the cutting can also be given from the extent of rounding of the cut edges.

18.7.7 Bleached or Dyed

Microscopic examination of hairs reveals whether they are dyed/bleached or not. Chemical examination of the dye or the bleach reveals the identity of the dye or bleach. TLC helps in the identification of the dye or bleach.

18.7.8 Parts of the Body

Hairs from some parts of the body have characteristic morphological structures and contamination. They indicate the part of the body from which they have originated. For example, nasal secretion may indicate that the hair has originated from the nose. Semen and similar secretions may show the pubic origin of the hair and waxy contamination may show ear as the source of the hair. The varying characteristics, given for the hair from different parts, are indicative only. The identity of the parts is not absolute. Therefore, unless there are some highly characteristic features in the hair, part of the body is given only 'probable'/'likely' terms.

Table 3

Characteristics of Human Hair on Various Body Parts

S. No.	Body Part	Length upto (cm)	Dia. µm	Root	Shaft	Tip	Config-uration	Medulla usually	Growth	Misc.
1.	Head	100	25-125	Small	Uniform thickness	Tapered	Wavy	Continuous, discontinueous, artificial fragmentary	0.4 mm/ day	May be
2.	Eye	5	Variable	—	Coarse	Pointed	Smooth curved	Large	0.16 mm/ day	—
3.	Eye lash	5	Variable	—	Short	Pointed	Curved	Continuous	—	—
4.	Beard	100	—	Large	Irregular	Usually cut	Wavy	Continuous	0.40 mm/ day	Sometime-cross section triangular
5.	Chest	5	Variable	Large	Variable diameter	Arch like tip	Wavy	Continuous	0.30 mm/ day	
6.	Armpit	5	Variable	Large	Lighter colour, course	Frayed some	Kinky	Continuous	0.30 mm/ day	More air in the cortex than in head hair
7.	Arm/ leg hair	1	Variable	Small	Lighter in colour	Fine	Curled	Irregular	—	—
8.	Pubic	6	Variable	With	Coarse follic	Tapered if uncut	Highly complex	Broad		Asymmetric cross section. ular tag Special Configuration variable; con-stricted twist-ed, buckling, ven straight

18.7.9 Poisoning

The concentration of poisonous metal, in slow poisoning cases, increases in the hair over time. It is detected and estimated in the roots and the shafts near the roots. The period over which slow poison has been administered can also be estimated.

18.7.10 Drug Addicts

Hair analysis to detect drugs of abuse has come up worldwide. It is being used increasingly in the United States, the United Kingdom, Canada, and other countries. The drug and its metabolites can both be identified and quantified. These drugs are those which the addict has ingested/injected/inhaled. They are not the drugs absorbed in passive mode. Besides, segmental analysis can give the period over which the addict has been abusing the drug.

Most hair tests screen and identify the main drugs of abuse Cocaine, Amphetamines, Methamphetamines, Opiates, PCP, and Marijuana (cannabis).

The hair testing results are both legally and scientifically recognised, almost all over the world.

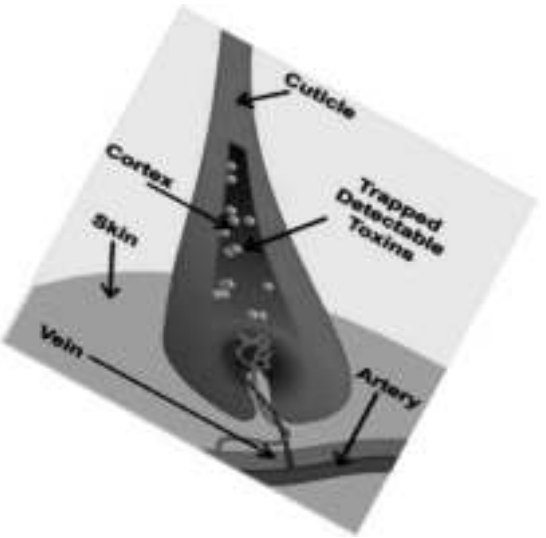

Fig. 18.15
Drug transfer from blood to hair

18.7.11 Drunkenness

Hair testing for alcohol markers is now recognised/utilised, both in UK and US judicial systems. Body hair growth of head hair is used to study the timeframe in body hair for up to 12 months.

Alcohol reacts with fatty acids in the body to form esters called **F**atty **A**cid **E**thyl **E**sters (FAEEs) They are:

1. Ethyl myristate,
2. Ethyl palmitate,
3. Ethyl oleate and
4. Ethyl stearate)

They are used as indicators of the alcohol consumption. The amounts found in hair are obtained in nanograms (10^{-9} g).

Ethyl Glucuronide (EtG) is another metabolite, which is used to ascertain drinking time. It can be detected even in picograms (10^{-12} g).

Hair alcohol testing is a commercial in the UK.

Hair test for drinking is superior in many ways, including:

1. The test material is easy to collect and process
2. It is non-invasive
3. It covers long periods

18.7.12 Contamination

The dust and other contaminants of hair are identified by micro-chemical and instrumental methods.

18.7.13 Individualisation

Nuclear DNA, found on the live roots when there is blood, skin or flesh sticking to it, can individualise the hair in most of the cases. The discovery of *Mito*chondrial DNA, has, as seen above, changed the discrimination power of the hair tremendously. The hair can now provide high discrimination in about 80% of the cases.

*mt*DNA is not specific to one individual. However, it can be used with other evidence (anthropological evidence, circumstantial evidence, and the like) to establish identification. *mt*DNA is certainly an effective weapon for possible eliminations. Further, a match with a living relative is possible even if maternal generations separate the two.

Exposure to light, bacteria, dust, and dirt affect the determinations.

Hair Evaluation (Nutshell)

A. Purpose: it helps to:

1. Find if it is hair and whether it is human or animal hair.
2. Ascertain the body part from which it has come.
3. Identify the racial group.
4. Determine the age/sex of the person
5. Determine suitability for DNA analysis
6. Identify the subject through DNA (*Nuclear-/mito*chondrial) analysis.
7. Compare and link the criminal, the victim, the crime scene, the points of ingress/egress, the weapon of offence, the vehicle used, in some the routes of approach/departure and of modus operandi/versions(s) *inter se*.
8. Identify poisoning, poison and the period of poisoning.
9. Identify disease/damage of the hair
10. Identify hair sprays, gels, or other hair treatment of the hair which helps match crime-sample hair
11. Identify the drug addict, the drug taken, the quantity of the drug and the period of addiction.
12. Identify the drunk, the amount of alcohol intake and period of intake.

B. Process

1. IO collects cross-transferred crime hairs from the scene and sample hairs from the suspected parts of body of suspect; ensuring their relevancy, identity, integrity, authenticity and an unbroken chain of custody, from the time of collection to the time of presentation of the evidence in the court.
2. The forensic scientist Links the culprit with the crime through comparison of hairs (length, diameter, colour, hair structure, medulla, pigmentation, scale, medullary index, hair parts (root, shaft, tip) colour, treatment material, evidence of disease, damage, DNA.
3. The expert presents the evidence in court in nontechnical language, with relevant data, illustrations, photographs, etc. to support the presentation convincingly.

18.8 ADDITIONAL READING

1. Robertson, J. *Forensic Examination of Hair*. Taylor and Francis, London, 1999.
2. SWGMAT (Scientific Working Group on Materials Analysis). *Forensic Human Hair Examination Guidelines.* Internet. 2005

18.9 CASE LAW

18.9.1 Identification[1]

Author's Summary

Two persons murdered the victim. Their extrajudicial confessions, bloodstained clothes/ Kirpan and other evidence identified them. The apex court, however, found clinching evidence when the hair on the Kirpan matched with the hair from the head of the victim.

Highlights italicised

Relevant Extracts (Verbatim)

The High Court has pointed out that there was sufficient circumstantial evidence, even apart from the extra-judicial confession to connect the two accused with the murder of the deceased. There was the evidence of the recovery of the blood-stained clothes from Surjit Kaur, there is evidence of Sarwan Singh who had seen the deceased along with Surjit Kaur and Maghar Singh shortly before the murder took place and immediately thereafter. The F.I.R. was lodged on 15 June 1972 at 9.00 am, the blood-stained Kirpan was also recovered at the instance of the accused Maghar Singh and the blood was found to be human blood. The matter did not rest here, but even bloodstained clothes were found from the person of the accused which also contained human blood.

> *Apart from this circumstantial evidence, which conclusively connects the deceased, namely, recovery of the weapon of offence, the false explanation given by Surjit Kaur, the recovery of the clothes from the person of the accused, there is another important circumstance which almost clinches the issue and completes the link in the chain of circumstantial evidence and this is that the Kirpan recovered from the possession of the appellant Maghar Singh contained braids of hair of the deceased stuck to it and on scientific examination the braids were found to be identical with the hair of the deceased. This, therefore, completely establishes that it was the accused Maghar Singh alone who had caused the death of the deceased with the Kirpan and this circumstance is not explainable on any other hypothesis except that the accused was guilty of the offence of murder.*

1. *Maghar Singh v State of Punjab*, AIR 1975 SC 1320 : (1975) 4 SCC 234 : 1975 Cr LJ 1102 (SC).

Thus, the circumstantial evidence against the accused referred to above is not only conclusive and independent to prove the charge for the offence of murder but also constitutes substantial and sufficient corroboration of the approver's statement in material particulars.

18.9.2 Hair and Article 20(3) of the Constitution[2]

Author's Summary

A student is a hostel at Jaipur, was beaten to death. The IO collected hair from the scene and wanted to collect hair from the culprits. Their lawyer objected that the collection infringes Art 20(3) as it made them a witness against themselves. The court quoting the apex court said it does not. Hair are materials and as such do not furnish evidence like oral/written statements.

Highlights italicised

Relevant Extracts (Verbatim)

One Dilip Singh is alleged to have been beaten in room No. 42 of Vivekanand Hostel, in Jaipur, on 3 February 1970, at about 2.30 pm. The First Information Report of the incident was lodged the same day at police station Gandhinagar, and a case was registered for offences under sections 307 and 452 read with section 149, and section 148, IPC. The room was inspected by the investigating officer on 4 February 1970 in the presence of "motbirs," and some hair was found on and under the bed of Dilip Singh and on the wall. They were taken in police custody under memorandum (B/76) for purposes of comparison. Dilip Singh succumbed to his injuries on 14 February 1970. The investigation of the case was then made over to the Central Bureau of Investigation, Government of India and the case was altered to one for offences under sections 148, 302, 307, 453 read with section 149 and section 120B, IPC. During the course of the investigation, the deputy superintendent of police, Central Bureau of Investigation, made an application on 12 March 1970, to the special magistrate, stating that it was essential for purposes of investigation that the hair which had been recovered from the scene of occurrence should be examined by experts and compared with the hair of the "principal accused" like Vijay Punia and Mahipal Maderna "with a view to fix up the identity of the hair recovered by the police from the scene of occurrence." It was prayed that accused Vijay Punia and Mahipal Maderna may be called and directed to give a few specimens of their hair in the presence of the court for that purpose. The learned magistrate allowed the application and recorded an order to that effect on 6 April 1970. Mahipal Maderna and Vijay Punia filed an application before the Sessions Judge for revision of that order, and this is how the present reference has been made by the Sessions Judge for quashing the order.

It has been argued by Mr. Bhimraj, learned counsel for accused Vijay Punia, that the reference should not be accepted for the reason that the order of the learned magistrate violates the fundamental right of the accused under Article 20(3) of the Constitution inasmuch, as it compels each one of them to be a witness against himself. Reliance for this submission has been placed on *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC); *Pritam Singh v State of Punjab*, AIR 1956 SC 415 : 1956 Cr LJ 805 (SC) and *Rochin v People of California*, (1952) 342 US 165 : 96 Law Ed 183. The learned counsel has further argued that the investigating officer could make an order for the production of the hair only under section 94(1), Cr PC but that section does not apply to the accused as has been held in *State of Gujarat v Shyamlal Mohanlal Choksi*, AIR 1965 SC 1251 : 1965 (2) SCJ 18 : (1965) 2 SCR 457.

2. *Mahipal v State of Rajasthan*, 1971 Raj LW 43 : 1971 Cr LJ 1405 (Raj).

Now clause (3) of Article 20 of the Constitution provides as follows:—

> 20(3). No person accused of any offence shall be compelled to be a witness against himself.

In the United States of America also the immunity against self-incrimination is constitutional, and the Fifth Amendment provides, *inter alia* as follows:

> *No person ..... shall be compelled in any criminal case, to be a witness against himself.*

It will thus appear that the provision in our Constitution is similar to that in the Fifth Amendment of the American Constitution, so that it will be profitable to examine the argument of the learned counsel in the light of the decisions in this country and the United States.

The nature and the meaning of the aforesaid privilege against self-incrimination have been considered at length in Wigmore, Evidence section 263—(Mc Naughton rev. 1961), and it has been stated as follows:—

> .....It is not merely any and every compulsion that is the kernel of the privilege, in history and in the constitutional definitions, but testimonial compulsion. The later idea is as essential as the former. (p 379)

It has then been further stated in section 264 (supra) that while it is universally conceded that the production of documents or chattels by a person in response to a *subpoena*, or to a motion to order production, or to other form of process relying on his moral responsibility for truth telling, may be refused under the protection of the privilege, documents or chattels obtained from the person's control without the use against him of process relying on his truth-telling are not within the scope of the privilege. As Mr. Justice Holmes said in *Johnson v United States*, (1913) 228 US 457 "a party is privileged from producing the evidence but not from its production."

> *In our country, their Lordships of the Supreme Court have laid down in M.P. Sharma v Satish Chandra*[3] *that, broadly stated, the guarantee in Article 20(3) is against "testimonial compulsion", but there is nothing to confine the content of the guarantee to oral evidence in the courtroom and that it may well extend to compelled testimony previously obtained against him, as also to any compulsory process for the production of evidentiary documents which are reasonably likely to support a prosecution against him. It has further been laid down that neither the search nor the seizure are acts of the occupier of the searched premises, for "they are acts of another to which he is obliged to submit and are, therefore, not his testimonial acts in any sense.*

The matter again came up for consideration in *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC) and while considering the earlier judgment in *M.P. Sharma's* case,[4] their Lordships have held that the expression "to be a witness" in its original grammatical sense means giving oral testimony in court, but that the case law has gone beyond this strict literal interpretation of the expression which may now bear a wider meaning namely, bearing testimony in court or out of court, by a person accused of an offence, orally or in writing. Their Lordships have taken note of the observation in *M.P. Sharma's* case that "to be a witness" means "to furnish evidence" and includes not only oral testimony or statements in writing of the accused but also production of a thing or of evidence by other modes, and have observed that it may be that the court did not intend to laydown that "calling upon a person accused of an offence to give his thumb impression, his impression of palm or fingers or of sample handwriting or signatures comes within the ambit of 'to be a witness' which has been equated to furnishing evidence." In para 10 they have laid down the law as follows:

> *"To be a witness" may be equivalent to 'furnishing evidence' in the sense of making oral or written statements, but not in the larger sense of the expression so as to include given thumb impression or impression of palm or foot or finger or specimen writing or exposing a part of a body by an accused person for purpose of identification. 'Furnishing evidence' in the later sense could not have been within the contemplation of the Constitution makers for the simple*

3. 1954 SCR 1077 : AIR 1954 SC 300 : 1954 Cr LJ 865.
4. *Ibid.*

> *reason that though they may have intended to protect an accused person from the hazards of self-incrimination, in the light of the English Law on the subject—they could not have intended to put obstacles in the way of efficient and effective investigation into crime and of bringing criminals to justice. The taking of impressions of parts of the body of an accused person very often become necessary to help the investigation of a crime. It is as much necessary to protect an accused person against being compelled to incriminate himself, as to arm the agents of law and the law courts with legitimate powers to bring offenders to justice.*

Their Lordships have also dealt with the character of the self-incriminating evidence and made the following observation:—

> *In order that a testimony by an accused person may be said to have been self-incriminatory, the compulsion of which comes within the prohibition of the constitutional provision, it must be of such a character that by itself it should have the tendency of incriminating the accused, if not also of actually doing so. In other words, it should be a statement which makes the case against the accused person at least probable, considered by itself. A specimen handwriting or signature or finger impressions by themselves are no testimony at all, being wholly innocuous, because they are unchangeable except in rare cases where the ridges of the fingers or the style of writing have been tampered with. They are only materials for comparison in order to lend assurance to the court that its inference based on other pieces of evidence is reliable. They are neither oral nor documentary evidence but belong to the third category of material evidence which is outside the limit of 'testimony'.*

The law has thus been well-settled by the above pronouncements of their Lordships of the Supreme Court.

As in the present case I am concerned with the identification of a part of the body of the accused, namely their hair, exposing the hair or taking specimen thereof cannot be said to be "furnishing evidence".

It may be mentioned that while dealing with the bodily condition of the accused, his claim to the privilege of the Fifth Amendment (extracted above) has been answered as follows in Wigmore's: *Evidence*, section 265 (Mc Naughton Rev. 1961) (p 386).

> *section 265. Bodily condition (clothes, features, fingerprints, medical examination,).* If an accused person were to refuse to be removed from the jail to the court-room for trial, claiming that he was privileged not to expose his features to the witnesses for identification, it is not difficult to conceive the judicial reception which would be given to such a claim. And yet no less a claim is the logical consequence of the argument that has been frequently offered and occasionally sanctioned in applying the privilege to proof of the bodily features of the accused."
>
> "The limit of the privilege should be plain. From the general principle it results that an inspection of the bodily features by the tribunal or by witnesses does not violate the privilege because it does not call upon the accused as a witness *i.e.*, upon his testimonial responsibility. That he may in such cases be required sometimes to exercise muscular action as when he is required to take off his shoes or roll up his sleeve is immaterial, unless all bodily actions were synonymous with testimonial utterance; for, as already observed, not compulsion alone is the component idea of the privilege, but testimonial compulsion. What is obtained from the accused by such action is not testimony about his body, but his body itself. Unless some attempt is made to secure a communication written, oral or otherwise upon which reliance is to be placed as involving his consciousness of the facts and the operations of his mind in expressing it, the demand made upon him is not a testimonial one. Moreover, a practical consideration applies to this class of evidence. When the person's body, its marks and traits are in issue, there is ordinarily no other or better evidence available for the prosecutor.
>
> Hence the public interest in obtaining the evidence is usually sufficient to outweigh by a clear margin the private interests in the process.
>
> Both principle and practical good sense forbid any larger interpretation of the privilege in this application.

In this state of law, which should apply equally to our country, there can be no justification for the claim of the accused that the impugned order of the learned magistrate denies them the privilege against self-incrimination guaranteed by Article 20(3) of the Constitution. This is a case in which

the question of the identity of the accused will be the main question for consideration and decision. And the recovery of some hair from the place of occurrence has prompted the investigating officer to make an effort to utilise that piece of evidence for the purposes of establishing the identity of the participants in the crime, if possible. His effort to make use of that material is quite genuine for it cannot be doubted that, in the case of a person's body, its marks and traits are the main evidence for purposes of its identification and there is no reason why the investigating officer should be prevented from making use of it when it is well-settled that there is no protection against the exhibition of the body of the accused. The privilege against self-incrimination does not extend to the use of defendant's body as real evidence.

Wigmore (supra) has summarised a number of cases on the question of the privilege against self-incrimination, and the following notes deserve a mention for purposes of the present controversy:

State v Tettaon, (1900) 159 Mo 354 : 60 SW 743 (testimony of physicians to the condition of a wound on defendant's head, shaved by compulsion, admissible). (p 390);

State v Maclaughlin, (1916) 138 La 958 : 70 SC 925 (murder; no denial of constitutional privilege to use scrappings from under fingernails, taken against the will). (p 392);

Smith v United States, 194 F. 2d 192 (D.C. Cri 1950) (homicide and rape; forcibly dyeing defendant's hair for purposes of identification upheld). (p 397); and

People v Strauss, [(1940) 174 Misc 881] (motion by district attorney to require defendant to be shaved and have the hair on his scalp trimmed was granted; privilege held inapplicable). (p 398).

The view taken in these decisions seems, with all respect, to be quite correct and forthright, and there is no reason why the application of the investigating officer should not have been allowed in the present case.

18.9.3 Hair Evidence Essential[5]

Author's Summary

In a murder case bloodstained hair were collected from the drain of the house of the accused. The IO also collected sample hair of the deceased. However, no comparison/examination was done. Valuable evidence was wasted! Why?

Relevant Extracts (Verbatim)

The bloodstained hair recovered from the drain of the house were not sent for comparison with the hair of the deceased and as such, there is no evidence on the record to show that the bloodstained hair recovered from the drain of the house of the accused was that of the deceased only. This lapse on the part of the investigating agency to have the bloodstained hair compared with the hair of the deceased is a serious lapse and has deprived the court of a very valuable piece of evidence which could have clinched the case specially when according to Dr. M.L. Gupta, P.W. a few hairs of scalp of the deceased were got removed by the police and packed and sealed in his presence. No explanation is forthcoming as to why these were not got compared with the bloodstained hair recovered from the house of the accused. It would not be too much in these circumstances to draw an inference against the prosecution that had these been got compared they would not have supported the prosecution case. This recovery, therefore, does not advance the case of the prosecution nor does it connect either of the accused with the crime.

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5. *Mazahar Ali v State of Jammu and Kashmir*, 1976 Kash LJ 179 : 1976 Cr LJ 1629 (J&K).

CHAPTER 19

BLOOD

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"Will all great Neptune's ocean wash this blood clean from my hand? No, this my hand will rather the multitudinous seas *incarnadine*, making the green one red."

Shakespeare in *Macbeth*

Blood Evidence in 13th Century

Song Si was perhaps the first person to report, in his book (**Washing Away of Wrongs**), *the use of blood as evidence to identify a murderer. It happened in 13th century, in China, In that case, the throat of a farm worker was slit with a sickle. A number of farm workers were working on the farm to cut the crop with their sickles.*

The investigator suspected that one of the workers had murdered the victim, presumably with his sickle. He tested a test sickle to create wounds on animal carcasses. He kept the sickle in the open environment. He observed the sickle attracted flies and a number of them gathered thereon.

He instructed everyone to bring his sickle to one location and asked them to lay their sickles side by side, in the open. Only one sickle attracted flies.

The case stood solved. The sickle with blood thereon attracted the flies. The owner of the sickle alone could be the murderer. In the light of this transparent demonstration, the murderer confessed to the crime.

Perhaps the first case of blood evidence!

19.1 GENERAL

Among the body fluids, which include blood, semen, saliva, urine, sweat, nasal secretions, tears, human milk forensically, blood is the most important fluid. It plays a very important part of crime detection. It is a mute witness in offences against persons. Now, with the discovery of DNA profiling, which provides a definite identification/linking evidence, it is the most important piece of evidence along with other body fluids/parts to provide proof of the guilt, beyond a reasonable doubt. Remarkable strides in genetics have changed the scenario, and the individuality of blood is a reality now.

In addition, blood spatter patterns at the crime scene furnish data for reconstruction of the crime.

Blood as evidence has passed through many stages. It was possible only to say whether a given stain is of blood or not, in the initial stages. Later, it became possible to identify whether the given bloodstain is from a human being or from an animal. Further progress made it possible to classify blood into four main groups, O, A, B, and AB. Later, the division was extended further. For example, group A factor was found to exist in six forms, A_1 to A_6. Excepting A_1 and A_2 others are rare. Sub-division of A into A_1 and A_2 brought blood group division to six. Determination of M, N and MN types, the study of P factors and eight 'Rh' types, Duffy, Lutheran, Lewis, Gm, Gc serum group and enzymatic groups like PGM, AK, divide blood into hundreds of groups. Discovery of additional antigens, antibodies, and behaviour of blood in the electric field (electrophoresis) has increased the division of blood in many groups. They have increased the discrimination probability figures manifolds. However, the discovery of DNA[1] profiling has revolutionised the value of blood evidence. DNA profile of a person is unique (individualistic) like fingerprints. In fact, blood evidence today, is far superior to fingerprint evidence. It is now possible to individualize a given sample of blood and to say that it belongs to the given individual and to nobody else, except for identical twins.[2]

1. See chapter 21 on DNA profiling.
2. There are roughly 12 million monozygotic twins in the world!

DNA profiling has made the blood evidence definite. However, the classical techniques still continue in almost all the laboratories in India because of high cost, time involved and sophistication involved in the DNA profiling process. Continued research is tackling all these problems. DNA profiling is likely to be used routinely in the coming times.

19.2 NATURE

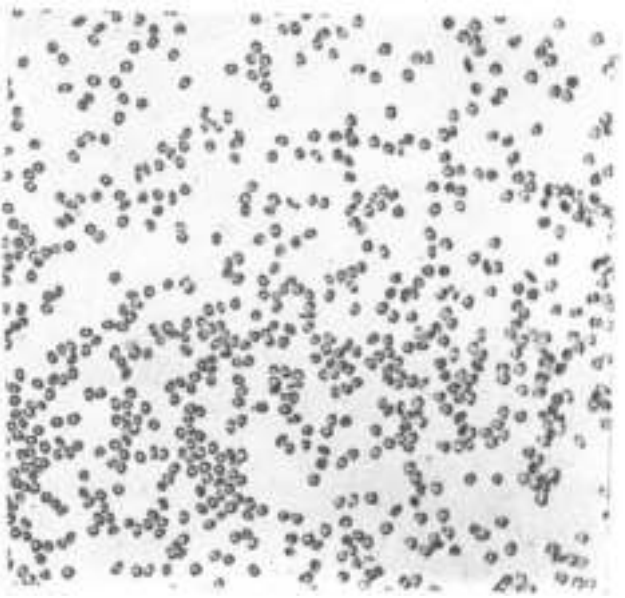

Fig. 19.1
Blood Corpuscles under Microscope

The red fluid in the body living person is blood. It is about 7% of body weight in human beings. It has both liquid and solid constituents:

1. The liquid part is called plasma. It forms 55% of the blood volume. It is mostly water (~90%). Plasma bereft of fibrinogen (and other clotting factors) is a serum.
2. The solid constituents are mainly:
   - **Red blood cells (erythrocytes);** they occupy 44% of the blood volume. They are also called **red corpuscles.**
   - **Platelets;** they are about 0.7% by volume. The other names for platelets are **thrombocytes** and **discs**.
   - **White cells (leukocytes);** they are the remaining part of the plasma.

When the blood flows out of the body, a part separates out as blood clots consisting of blood corpuscles and discs. Platelets (discs) are responsible for the clotting of the blood. The liquid left after coagulation is a serum.

19.2.1 Red Cells

There are about five million red cells per micro-litre of blood, each about ten microns in diameter. The red cells are continuously being produced and destroyed in the body. The rate of destruction is about ten billion cells per hour in a normal healthy adult.

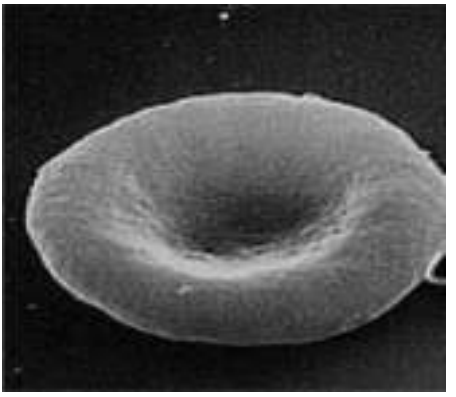

Fig. 19.2
Scanning Electron Microscope image of a red cell

19.2.2 Haemoglobin (Hb)

The colour of blood cells is due to haemoglobin. It is the iron-containing oxygen-transport metalloproteinase in the red blood cells of all vertebrates with the exception of some fish. The protein plays an important role in the functioning of the body. It transports oxygen to various body parts, where it combines with the food materials to provide energy to the body.

19.2.3 White cells

White cells, also called white blood corpuscles or leukocytes (or leucocytes) called leukocytes, are the **cells** of the immune system. They are produced by the bone marrow's multi-potent **cells, called** hematopoietic stem **cells**. They protect the body against both infectious disease and foreign invaders. The number of white cells is about four to eleven thousand cells per micro-litre. They resist and fight the attack of diseases germs.

Fig. 19.3
Scanning Electron Microscope image of white corpuscle

19.2.4 Platelets

Platelets are lens-shaped entities with a diameter of 2-3 um, roughly about one-fifth of the size of a red corpuscle. They are important constituents of the blood of mammals and are 5 to 10 % of the red corpuscles and about 5 times the number of white corpuscles. Their main function is Homeostasis, that is, to stop bleeding by clotting the blood at the injury site (at the oozing point)). They congregate around the wound to stop blood flow out of the tissue.

They come from bone marrow.

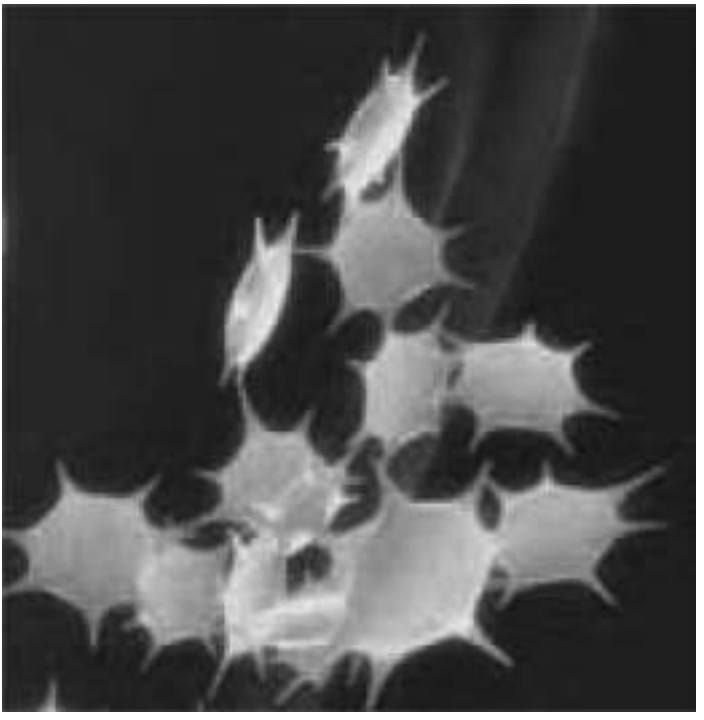

Fig. 19.4
Platelets in Human Blood

19.2.5 Blood Plasma and Serum

Blood plasma is the pale yellow liquid of blood. It keeps blood cells in suspension. It is about 55% of the body's total blood, by volume. It is mostly water (about 90 % by volume). It contains proteins, albumins, glucose, clotting factors and a host of electrolytes. Plasma is the main medium for transportation of the excretory products.

Blood serum is blood plasma without clotting factors.

Plasma and serum are complex mixtures of proteins, (enzymes, antigens, antibodies), minerals and organic compounds dissolved in water.

The amount of blood varies from individual to individual. It also varies in the same individual in different periods of his life, depending upon his age, diet and the work function Roughly an adult weighing sixty-five kilograms have about five kilograms of blood, *i.e.*, about one-thirteenth part of the body weight.

19.2.6 Drying

The blood evidence, in a criminal investigation, is in the form of dried stains most of the time. The following factors affect the drying of the stain:

1. Temperature
2. Humidity
3. Quantity of blood
4. Surface bearing the stain
5. Atmospheric conditions, including rain and wind.

As soon as bleeding starts, the drying process also starts and the changes in the drying process of the blood continue.

The first change in liquid blood, on exposure, is its clotting. The proteins lose some of their activities. Bacteria, fungi, heat and light may bring other changes. The process of change continues and with time, the blood may lose all its identifying characteristics. It is, therefore, advisable that blood is examined at the earliest.

The colour of the stain also undergoes successive changes with the passage of time. The colour changes in the blood/bloodstains can indicate time elapsed since the bleeding started... However, many variables affect the process, including the following:

1. Amount of blood
2. substrata
3. Environmental conditions; closed or open place
4. Atmospheric conditions (humidity, temperature, wind)

The above variables hinder proper estimation of age of stains from its colour. The estimation, at best, remains an intelligent guess in most of the cases.

19.2.7 Functions

Blood is the lifeline of a living being. It sustains life by providing food (and energy) to the body, it saves it from diseases and maintains proper temperature. The main blood functions are transportation, protection and protection. The three major functions in brief are:

Transportation; it transports many materials including the following:

- Gases; namely, oxygen/carbon dioxide between the lungs and rest of the body *inter se*
- Nutrients; it transports them(glucose, minerals etc.) from the digestive tract and storage sites to the rest of the body
- Drugs/Medicine; it transports injected/inhaled/ingested drugs/medicine to the relevant sites.
- Hormones; it takes them from the gland to body parts
- Metabolic waste**;** removes it from body parts to the disposal outlets

Protection

- It performs homeostasis; supply platelets to the injured site to control bleeding through blood clotting.

  It supplies white corpuscles to fight diseases.
- It maintains reserves of water, food and electrolytes

Regulation; It regulates many processes including the following**:**

- Regulates body temperature
- Controls acidity/alkalinity (pH) of the body
- Maintain water contents of cells

19.3 IMPORTANCE

Blood is one of the most important clue materials in crime investigation. It figures prominently in most of the serious crime. It is especially so in offences against persons.

> *Within a period of two weeks, 18 persons, while asleep at night, were killed in Mumbai. All of them had one fatal head injury caused by a blow from a heavy pointed weapon.*
>
> *A suspect was apprehended. His clothes carried small-sized bloodstains. They pointed the needle of suspicion towards the man.*
>
> *He carried other evidence also. His shoes had deposit of soil. He had a specially improvised iron bar with him, which carried bloodstains. Bloodstains on his clothes, weapon and on the clothes of the deceased in the last reported case were of group AB. The blood evidence served kingpin evidence against the accused. Soil on his shoes compared well with the control sample obtained from the crime scene. An unused piece of the iron bar left over with the blacksmith who improvised the weapon for the accused was recovered at his instance. Laboratory examination clearly revealed that the weapon used in this crime was made from the same iron bar as the piece found with the blacksmith.*
>
> *The suspect, Raman Raghav*[3]*, admitted all the 18 and other killings. (CH)*

The proper study of the evidence helps the investigation of a number of different types of offences against persons in the following ways:

1. It establishes *corpus delicti;* the occurrence of crime.
2. It links the crime, the criminal, the victim, the crime scene, the weapon of offence and the vehicle used in the crime, *inter se*.
3. It helps to discriminate between real and fake crime scenes.
4. It identifies the victim, the culprit and the animal if involved in the crime.
5. Its (blood) spatter helps in the reconstruction of the crime.
6. It permits determination of the sequence of occurrence of a crime, from the presence/spatter/distribution of blood at the scene/culprit/victim.
7. It is possible to guess the approximate time when the crime was committed from the study of the age of stains, rigor mortis and hypostasis (lividity).
8. It helps the investigation/identification of poaching, poachers and poached animals. In addition it provides linking evidence in maiming and worrying.
9. It helps to establish the paternity of a child in disputed cases and expose adultery.

3. ***Raman Raghav***, who terrorized ***Mumbai*** in the 1960s with a series of random murders, remains a psychological puzzle.

A 3-year-old victim succumbed to her injuries caused during her rape. Bloodstains on her clothes, on the clothes of the accused and on some articles at the crime scene were of 'O' group. On examination, it was found that the post-mortem blood of the deceased was of O group while that of the accused was of A group. (CH)

The detection and evaluation of blood evidence is a delicate process. The external factors: contamination, putrefaction, over-heating, bacterial growth and action of chemicals interfere in the evaluation of the evidence. The substratum (surface on which the blood evidence is found) also affects it. Likewise, the age deteriorates the bloodstains. Thus, to obtain the best results, blood evidence needs immediate expert handling.

19.4 PROBLEMS/POSSIBILITIES

A forensic biologist/serologist handles the blood evidence. In normal cases, he can answer most of the investigator's questions, including the following:

1. Are there bloodstains at the crime scene?
2. Is the quantity of blood at the scene consistent with the injuries on the deceased or injured?
3. Is there blood spatter at the crime scene? Does it help in the reconstruction of the crime? Does it indicate scuffle of defence effort?
4. Has the crime scene been washed/cleaned and the blood/bloodstains/blood traces removed? Are the blood traces recoverable/identifiable?
5. Is the blood, found at the crime scene, from the culprit, victim or both?
6. Does the weapon, recovered from the crime scene/culprit/his residence/office, carry blood from the victim?
7. Do the clothes of the culprit carry the blood of the victim, washed or otherwise?
8. Does the debris collected from the clothes/hair/nails/shoes contain blood from the victim?
9. Do the swabs/washings from the sexual organ and the pubic hair of the culprit carry blood from the victim?
10. Is the recovered blood/bloodstain/smear of human or animal blood?
11. What is the blood group of the human bloodstain?
12. What are the species of animal to which the blood belong?
13. How much blood has been shed at the scene?
14. What is the age of the stain?
15. Is the child biological issue of the alleged parent?
16. Did the person suffer from any disease like syphilis or leukaemia? If so, to what extent was the disease responsible for the death of the person? This is possible when liquid blood is available.
17. Are there any artefacts to show the body part from which the blood has come?
18. Does blood contain alcohol? If so, how much alcohol has the subject taken?
19. Does blood contain carbon monoxide, hydrogen cyanide or other poison?
20. Does the blood contain narcotic drug?

A forensic toxicologist answers the last three questions.

19.5 LOCATION

Fig. 19.5
The 'bloody scene' helps to envisage the sequence of events, and the extensive struggle that must have ensued between the victim and the culprit

The location of blood evidence is, ordinarily, not troublesome. However, in some cases where the search is started after a lapse of time it becomes a difficult task because the stain may change colour and become indistinguishable with the substrata. Or, wind/rain/heat/light may wholly or partially cover or wipe it off. Human beings, animals or traffic may also destroy the stains, wholly or partially. Washed blood is also not visible to the naked eye. Location of blood evidence involves the following:

19.5.1 Search

The search for the location of bloodstains and other blood evidence:

1. The IO examines the area, articles and clothing suspected to bear bloodstains with strong oblique light, even during daytime, and a magnifying lens. Most of the stains become visible.
2. If the invisible blood evidence is suspected to be on portable article or on garments, it is sent to the Forensic Science Laboratory. There the article/garment is spread on an examination table with white top. A shadow-less strong light lamp illuminates the exhibit for the examination. The table has also an arrangement for movable stereoscopic examination with a long flexible arm. The arrangement covers a large are a large of the table to cover the stereoscopic examination.
3. The examination table has arrangement for use of coloured lights. Red, green and yellow lights are used to create contrast. They sometimes reveal bloodstains. There are instruments which provide different coloured lights in addition to ordinary light and UV/IR radiations for the examination.
4. Ultraviolet rays are very useful to locate bloodstains on article suspected to carry bloodstains. The examination is done in a dark/semi-dark room. Even washed bloodstains become visible.

5. Infrared rays are useful to locate invisible bloodstains on coloured objects/garments. An infrared photograph reveals the bloodstains/spots.
6. The articles suspected to bear bloodstains is sprayed with luminol. It reacts with bloodstains to give fluorescence. Even decomposed blood reacts with the reagent. The reagent does not interfere with subsequent blood tests[4].

   The reagent is used to examine large areas, like washed floor, vehicles, etc. If the result is negative (no fluorescence); ordinarily, there will be no blood on the articles tested.

   The reaction is interfered by copper salts, which also give fluorescence with the reagent.

19.5.2 Location Sites

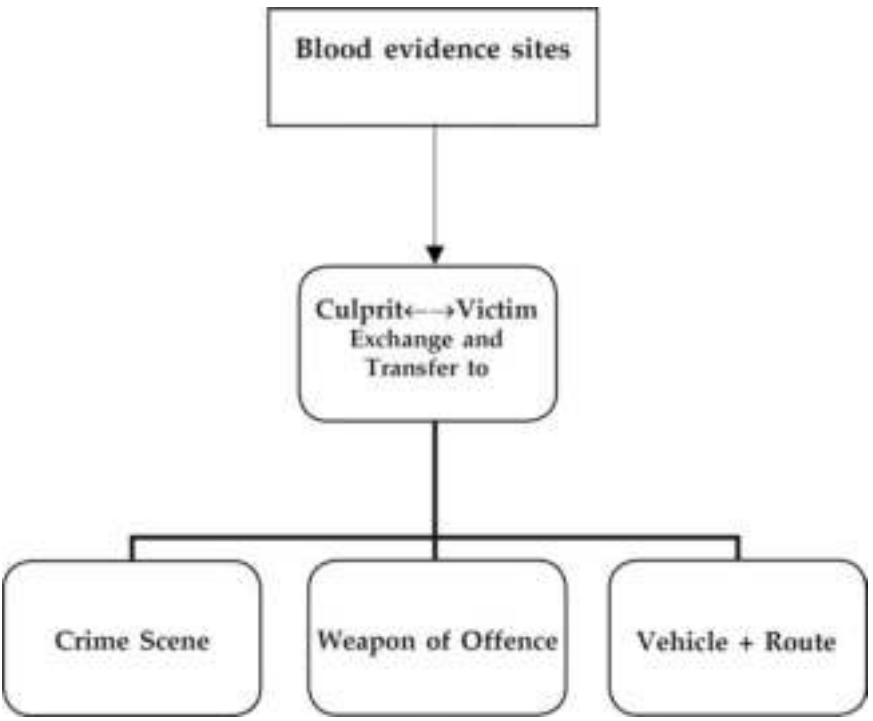

Fig. 19.6
Blood everywhere in offences against person

The important places for the location of blood are:

- The scene of occurrence,
- The culprit,

4. The reagent is prepared by taking water (100 ml), dissolving sodium perborate (0.7 g) 3-arninophthalhydrazide (0.l g) and sodium carbonate (5.0 g) in to make the reagent solution. It is sprayed upon the space/article suspected to carry bloodstains with glass sprayers in a darkroom. Strong luminescence indicates blood.

- The victim,
- The weapon of offence,
- The vehicle, and
- The route the culprit takes after the commission of the crime.

19.5.2.1 The Scene

The blood evidence found at the scene is in the form of stains, smears, streaks, splashes, spray, prints, clots, pools or liquid blood, on a variety of places and articles. It may be even clots trapped in washbasin trap. Or, it may be a water solution in the washbasin trap.

In indoor scenes, the floors, walls, doors, windows, furniture (chairs, tables, beds) and fans are the likely places. The position, size and the pattern of the stain, pools, etc., are carefully noted, sketched and photographed. They help in the reconstruction of the scene afterwards.

Clothing at the scene: wearing apparel (garments), bedding, curtains, upholstery, carpets, table covers and the like, may carry stains either due to spattering or due to wiping of the bloody hands.

The culprit may have used sundry items: paper, pieces of cloth, rags, articles of clothing, or other tissue material to wipe off the blood. He is likely to discard these items at or around the scene. They may be lying in dustbins, debris heaps, kitchen refuse or in water closets.

The blood from the scene is removed sometimes. The culprit may have washed his hands, face, clothes, the weapon of offence or even the stained area floor. The culprit thus succeeds in obscuring the blood evidence but it can be located. If floors, walls, doors, windows or furniture have been washed the evidence is available in cracks, crevices and joints. If clothes have been washed, blood may still be found under the seams or underneath the sleeves. If blood has been washed in a washbasin or in a closet, some clots are left in the traps attached to them.

The drawers and under surfaces of the furniture is also checked for wiped blood. If the culprit gets his hand and feet smeared with blood, he is likely to leave finger, palm, foot or footwear prints at the scene.

In outdoor scenes, the ground, the stones, the grass, the plant leaves, twigs and branches may carry blood. A rich growth of grass or dry or wet leaves may have been used to wipe off the blood. Or, earth, sand or dust may have been used for the purpose.

The wind may have blown dust, dirt, sand, grass or leaves over the scene covering the evidence. The scene is thoroughly searched for such hidden/covered evidence.

The culprit often discards paper, rags or other tissue material used to wipe off the blood and the blood-stained clothes. They may be lying scattered at the scene.

> *A housewife was found murdered in her home. The accused exchanged his bloodstained clothes with the clean ones from the house and escaped. Stains detected on the clothes left at the scene were both of A and B groups. The blood of the deceased and the bloodstains on her garments were of B group. On the suggestion from laboratory, blood sample of the accused was obtained and was found to be of A group. The matching of the blood group A of the bloodstain on the clothes left at the scene of crime with that of the accused provided strong corroboratory evidence. (CH)*

19.5.2.2 The Suspect

The culprit often carries blood on his hands, nails, hair, earlobes, feet, male organ (in sexual offences) and other exposed parts of his body.

> *A suspect was arrested a day after the murder. A small bloodstain found on his knee was of blood group B, which tallied with the blood group of the deceased. The accused had no other bloodstain on his person or clothes. His blood, however, was of group O. (CH)*

The culprit may carry blood on his clothing: trousers, shirt, coat, cap, tie, socks or shoes. The seams, joints and insteps of the shoes need special attention. These places are likely to retain blood for long periods. Even if the investigating officer has not been able to locate any blood, he takes the clothing into possession and sends them to the laboratory. The laboratory may locate some tiny stain or washed blood even on washed clothes.

A woman was found murdered in a first class compartment of a local train. Her ornaments/money was missing. Her blood group and that of the bloodstains found at the crime scene was B.

Later, snatched ornaments were recovered from one of the suspects. They had traces of blood of group B. A knife recovered at the instance of the second suspect. It carried blood group B stains. Bloodstains on the chapel (sleeper) and in the nail parings of the third suspect were also of group B. None of the suspects had B blood group. The presence of blood group B on the various entities strong corroboratory evidence against all the three murder accused. (CH)

19.5.2.3 The Victim

The victim, ordinarily, carries his own blood but in some cases, he/she may carry the blood of the culprit on his/her person and clothing especially if the victim had a scuffle with the culprit. If the blood is found of the same group as that of the suspect but different from the blood group of the victim, the findings provide a strong presumption of the suspect's guilt.

The victim is checked for blood/bloodstains of the culprit at the following sites:

1. **The nails**; the victim might have scratched the culprit
2. **The Teeth**; the victim might have bitten the culprit to extricate from the stranglehold of the culprit. The teeth may carry skin, flesh or blood of the culprit.
3. **Bleeding injuries;** If the culprit suffered bleeding injuries in the scuffle, the victim may carry culprit's bloodstains on clothes/body and it may also be found at the scene on the ground or on objects, in such cases.

19.5.2.4 The Weapon of Offence

If the culprit caused bleeding injuries to the victim, the weapon carries blood. In certain cases, most of the blood is wiped/washed off intentionally or otherwise. Even in such cases the joints, crevices and cracks of the weapon often retain sufficient blood to permit identification. The IO collects/sends the weapon invariably to the laboratory for blood tests.

If a firearm is discharged in contact or near-contact position, blood, skin and flesh pieces of the victim, get deposited on the firearms in some cases. They permit the identification of the blood group/DNA profile of the victim.

19.5.2.5 The Vehicle

If the culprit has used the vehicle in the commission of a crime or for the disposal of the body, the vehicle is likely to carry bloodstains from the injured/deceased where the body was placed. Even if the spot is cleaned, some traces of blood are likely to remain at the site.

If an injured or blood-soaked culprit has escaped from the scene in a vehicle, some blood is likely to get transferred to the vehicle. The amount is likely to be small. It is likely to escape notice on casual examination. The IO requisitions the laboratory experts to locate/collect the blood.

If the culprit has placed some blood-smeared objects like a weapon of offence, blood-covered valuables or clothes in the vehicle; they are likely to leave some traces on the vehicle.

If a blood-shedding occurrence has taken place in the vehicle itself, blood is found in the vehicle even if the culprit has tried to remove it.

19.5.2.6 The Route

The route followed by the culprit is checked for a blood trail or discarded blood smeared articles:

- If he is bleeding, he is likely to leave a blood trail.
- If he is carrying an injured person, he leaves a blood trail.
- If he is carrying a blood-dripping object, it leaves a blood trail.
- If the clothes of the culprit are extensively bloodstained, he discards them at the first opportunity, usually enroute.
- If he has other bloodstained objects, he gets rid of them at the earliest, usually return enroute.

19.5.2.7 Disposal Site

The culprit wants to get rid of incrimination objects. He may hide/bury the booty and their containers, the corpse or the incriminating evidence at a convenient secret place. The IO searches for the place. It is likely to carry blood, fragments of skin, flesh or bones at the site. It is possible to identify the victim definitely through DNA profiling.

19.6 COLLECTION

19.6.1 Basics/Preliminaries

When collecting blood evidence the investigating officer should:

1) Establish the location of the evidence and the position of the blood bearing article with respect to other fixed objects at the scene through videography, photographs, sketches and copious textual notes.
2) Record the direction, size and the number of stains.
3) Record the condition of the stains, whether they are dry, sticky, wet, contracting, puckering, crumbling or brittle.
4) Record whether the stains are contaminated or exposed to natural elements or heat. He records the conditions in his inspection notes. He informs the expert about these conditions in the forwarding letter.
5) Record the collection method of the stain: lifted, scraped, cut, dislodged or collected the object bearing the stain.
6) Pack bloodstains only after drying. Pack them separately from various sources in suitable vials or envelopes of appropriate sizes.
7) Preserve the purity of the stains by preventing mixing/rubbing of the stains with one another or with the container or with other parts of the article bearing the stain.
8) Preserve the relevancy/integrity/authenticity through proper packing, labelling, sealing and observing other legal formalities.
9) Maintain the continuity of the chain of possession from the time of recovery to the time of its production in the court in a custody log.

Sometimes there are a number of stains at the scene. It is difficult to make a proper selection of the stains for the collection. It is advisable to take the help of the laboratory staff in such eventuality, especially in important cases.

19.6.2 Techniques

Methods of collection of blood evidence vary with the nature of evidence and the place or article on which it is found. The following techniques cover most of the situations:

19.6.2.1 Liquid Blood

1) Liquid blood is sometimes found in blood pools at the scene. Two samples, each about five millilitres, are collected in clean vials. In one, sodium fluoride, oxalate or citrate is added and the other is kept without any preservative.
2) It is preferable to collect and send the liquid blood in sealed tubes without preservatives, keeping the tubes in crushed ice in a thermos bottle. A third sample is collected on a piece of white cotton cloth clean rag, about five cm^2. A part of the rag is left unstained which is used as control. The stain is dried and packed in a clean envelope or bottle.
3) If the blood in the pool has dried, about three grams of dried blood is collected.
4) If the blood in the pool is still sticky, some of it is picked up from the centre of the pool on a piece of cloth as stain. It is dried and packed as usual along with three grams of dried blood.

19.6.2.2 Wet Stains

The nature of the surface and quantity of the blood of the wet stain determine its collection mode. The experienced IO follows the drill:

1) Takes a clean piece of rag/filter paper and presses it against the stain. The stain is transferred to the rag. If the stain is partially dry, he moistens the piece, preferably with saline water before pressing. The piece picks up the stain. It is dried and dispatched.
2) If the stain is on a non-absorbent surface, he allows it to dry and collects the article.
3) If the stain contains sufficient liquid blood, he collects it in the same way as liquid blood, mentioned above.
4) If the blood is on an absorbent surface and has penetrated, the IO allows it to dry and collects the article.
5) If it is not possible to collect the article, for example, stains may be on earth or unpaved floor; the IO cuts the earth in a cone shape, puts the earth in a glass jar and sends it to the laboratory along with control sample of the unstained sub-strata.

19.6.2.3 Dry Stains

Dry stains are found in many situations. The IO collects them according to the situation:

1. **On clothes;** he takes possession of clothes bearing dry stains. He records the number, position and size of the stains on each. He keeps the stains separate whether they are on the same or different clothes so that they do not intermingle/contaminate one another during packing or transit.
2. **On the absorbent surface;** absorbent surfaces absorb the serum. Therefore, the IO collects stains as described in the preceding section.

3. **On non-absorbent surfaces;** the IO collect blood from non-absorbent surfaces in the following ways:
   - He collects the article; whenever possible.
   - Moistens a white clean piece of cotton rag (or filter paper) with saline water and press it against the stain. The piece picks up the stain. It is dried and dispatched with all the legal formalities
   - Moistens a piece of rag with inert gum and sticks it to the stain. The gummed rag piece picks up the stain. The piece is peeled off/dried/packs/dispatched, as usual.
4. He scrapes off the blood with a clean razor blade on to a paper and packs it in a clean envelope or vial. Ordinarily, scraping of bloodstain is not recommended, as some blood remains sticking. He collects it as in (2) or (3) above, if necessary.

On grass*;* when the blood is found on grass, the IO ties the grass with a thread. Cuts the tuft. Dries it and packs it in an envelope or glass jar. He takes care that the blood does not get dislodged in the process.

On body*;* bloodstains are sometimes found on the body of the culprit or of the victim. Their collection needs extra care to avoid contamination from the body:

- **Blood in the hair**; it is collected by combing the hair with a new fine comb. Alternatively, hair is clipped and collected.
- **Blood in the fingernails;** it is scraped out with a clean toothpick, along with a control sample from unstained fingers. The paring of nails is not done.
- Blood from other parts of the body is collected with a wet piece of clean rag or filter paper as discussed above. If the stain is adhering strongly the piece of cloth may be moistened with an inert gum solution.

There is an inherent danger of contamination in collecting bloodstain from the body. Body materials of the stain-bearing person can contaminate the collected stain. His blood sample, for control, is therefore, always collected/supplied.

19.6.2.4 Washed Blood

Laboratory staffs can locate/detect/collect traces of blood on washed clothes/surface. Their help, therefore, is requisitioned.

> *In a case of murder the scene of crime was a room with a pucca (hard) floor. The floor had been thoroughly cleaned. When the police examined the scene, no traces of blood was detected. Ultimately, the laboratory staff was requested to examine the scene. They found sufficient traces of human blood at the place where the water used for the washing of the room had collected (and dried). (CH)*

19.6.2.5 Blood Samples

Evaluation of the blood evidence requires blood samples from the victim(s) and the suspect (s). A medical officer collects them. However, investigating officer should ensure that the doctor uses unused syringes and clean containers to prevent any contamination. There should be no delay in the dispatch of the samples to the laboratory. They are properly identified, preserved (kept in a refrigerator) and dispatched. The chain of possession (custody) must remain intact (unbroken).

19.7 EVALUATION

Evaluation of blood evidence needs basic knowledge of biology and serology, proper training and ample experience. Above all the expert needs dedication, he must remain a man of science and keep up with the Joneses.

19.7.1 Basis

The evaluation of blood is based on its composition and behaviour under varying conditions. The evaluation studies relate to:

19.7.1.1 Cell structure

Blood, as already noted, is composed of red and white cells, platelets and plasma. The cells have definite shapes and sizes, which vary in different species. For example, human blood cells have characteristic non-nucleated discs (double concave) with a diameter of about 0.08 mm. Camel blood has oval blood cells. The birds, fish and reptiles have oval, nucleated and large corpuscles in their blood.

The identification of cell structure is possible in liquid blood; or, when the blood is fresh and moist, usually less than one day old. When the blood dries, the cell structure is usually damaged and it is not always possible to completely regenerate the blood cells.

A microscope is used to study the cell structure.

19.7.1.2 Haemoglobin

Haemoglobin on treatment with acids, alkalis, reducing agents or oxidizing agents gives a variety of products, which have characteristic absorption spectra of blood. They help to identify the blood.

The variations of haemoglobin used for the purpose are oxyhaemoglobin, acid and alkali haematins, methaemoglobin and cyanhaemochromogen. The absorption characteristics of these compounds identify blood.

A spectrophotometer is the instrument to study these spectra

19.7.1.3 Enzymatic activity

Blood contains *heme* in haemoglobin. It behaves like peroxidase. It catalyzes the liberation of oxygen from oxygen rich compounds like hydrogen peroxide or sodium perborate.

$$H_2O_2 \longrightarrow H_2O + \frac{1}{2}O_2$$

The liberated oxygen oxidizes certain colourless chemicals to give colour compounds. The common compounds used for colour reactions, for blood detection, are benzidine, phenolphthalein, leucomalachite green and luminol. The last gives fluorescence under UV light.

Other enzymes have been utilized to identify blood through electrophoresis' techniques. When blood is subjected to an electric field, these enzymes, due to some polarity thereon, move towards opposite charge poles. The rate of movement varies with their structure (stereochemistry), weight and electric charge of the enzyme. The pattern of separation is characteristic of blood. In fact, some blood types, based upon electrophoresis, have already been developed.

19.7.1.4 Antigens

The blood corpuscles have certain characteristic proteins called antigens. It is believed that the number of antigens is very large, over 160. They have complex stereochemical structures. If they are completely identified it may be possible to individualize the blood of a human being or of an animal through these antigens.

In addition, there are other proteins and cellular enzymes in the blood. Above 150 proteins and 250 enzymes have already been identified.

19.7.1.5 Antibodies

Corresponding to antigens, there are antibodies in the plasma (or serum). They are equally complex and large in number. They have a sort of negative relation with the antigens. For example, if a particular antigen is present in blood corpuscles, a particular type of antibody will be absent in the blood serum of that person. If the antibody is introduced in the blood, it coagulates (agglutinates) the blood cells.

Antigens and antibodies are also known as agglutinogens and agglutinins, respectively.

The study and identification of antigens and antibodies form the basis of classification of blood into various groups and their identifications by serological methods.

The most important antigens discovered so far are 'A' and 'B'. Likewise, corresponding antibodies are anti-A and anti-B, respectively. They divide the human blood into four major groups which are now internationally known as O, A, B, and AB.

Table 19.1
Presence of Antigen/antibodies in blood groups

S No	Blood group	Antigen A	Antigen B	Antibody A	Antibody B
1	**A**	**+**	**–**	**–**	**+**
2	**AB**	**+**	**+**	**–**	**–**
3	**B**	**–**	**+**	**+**	**–**
4	**O**	**–**	**–**	**+**	**+**

Note: **+** = Presence; **–** = Absence.

Further studies revealed that antigen A actually exists in a number of forms. Two of them: A_1 and A_2 can be used for further sub-classification of blood groups.

19.7.1.6 M and N antigens

Two more antigens in the blood corpuscles were discovered in the late twenties. It was found that they could be used independently of the previously known antigens. Thus, a person can have antigen M, N or both, M and N. The division of blood groups, thus, went up from, six to eighteen groups.

The scientists did not find the corresponding antibody to antigen N. Antibody to antigen M is also rare. Therefore, these antigens do not figure prominently in blood transfusions, but they are important in classification of blood.

19.7.1.7 P factor

Another antigen, named 'P', was found in the blood of certain persons, while that of others did not contain it.

Antibody relating to antigen P is sometimes found in normal human sera. Antigen P offers further sub-division of the blood groups, each of the eighteen groups is divisible into two groups, P-positive and P-negative, increasing the number of groups to thirty six.

19.7.1.8 Rhesus Groups

In the late thirties the immune sera was obtained from rabbits after injecting red blood cells from rhesus monkey. The anti-sera agglutinated about eighty five per cent of blood corpuscles of the white population irrespective of the fact whether or not they contain O, A, B or AB, M, N, MN or P antigens. The antigen responsible for this reaction was designated as Rhesus and assigned the symbol '**Rh'**. It doubled the number of existing groups.

Natural antibody to antigen Rh was not discovered in human blood. But antibodies were developed by Rh negative persons who were given Rh positive blood transfusions. The antibodies produced in human beings were of different kinds and permitted classification of blood into eight different Rh types. Thus, these antigens and antibodies brought the classification of blood to about three hundred groups.

All of these blood groups were being useful in settling the cases of disputed paternity. DNA has now taken over the task.

In addition to the above antigens and antibodies, the blood contains a host of other antigen and antibody populations. Some of the antigens are: Deigo, Duffy, Kell, Kidd, Lewis, Lutheran Xg and Yt. They are not used in the criminal justice system to any extent after the discovery of unique DNA profiles.

19.7.2 Evaluation Techniques

A number of techniques are used in the examination of blood. They involve physical, chemical and biological evaluations. The choice of techniques depends upon the nature of the evidence, *i.e.,* condition and size of the bloodstains, nature of the surface on which blood is found and the expert who may have a liking for certain techniques. The following evaluation techniques are common:

19.7.2.1 Visual Examination

Visual examination is useful to determine whether the given stain is of blood or not. Ordinarily, there is no difficulty in fresh stains but old stains may not be identifiable. The examination permits:

1. Determination of the number and size of stains
2. A rough estimate of the amount of bloodshed
3. The direction from which the blood has fallen is found from the tip of the elongated stain. The tip of the elongation points out the direction of movement of the person.
4. The shape of the stain indicates the height from which the blood has fallen.
    - Bloodstains from a height of up to 50 centimetres are round sharp edges.

- Bloodstains from a height of 50 to 150 cm have small spike like projections along the edges.
- Bloodstains fallen from a height over 150 centimetres have corrugated edges.

5. From the positions of the stains, the movement of the victim and the culprit can be determined. If bleeding culprit runs away, he can be tracked/followed through bloodstains.
6. The degree of fluidity, dryness and changes in colour permit rough estimation of the age of the stains.
7. Gross foreign matter like hair, flesh, bones in the blood may indicate the body part from which the blood has come.

   A magnifying glass improves the visual examination.

19.7.2.2 UV and IR Examination

Ultraviolet or infrared rays reveal washed or 'invisible' bloodstains from clothes, furniture, earth, floors, walls doors or windows. They also reveal stains on coloured garments or on painted surfaces. They help to reveal minute blood traces in various forms; streaks, spray, tiny fragments, etc.

19.7.2.3 Microscopy

Microscopic examination of bloodstains is important in many situations:

1. Species of origin of fresh bloodstains is established through microscopic studies and micro-measurements in some cases.
2. The part of the body from which the blood has come is found out from the nature of body matter associated with the blood. Thus, blood from nose, mouth, vagina or anus can be identified.
3. Diseases like leukaemia or syphilis can be detected microscopically.
4. Menstrual blood may be identified in some cases.
5. Blood from an infected site can be identified through the presence of puss.

Staining techniques, spectroscopic tests and some micro-chemical tests for blood evidence also use microscopy.

19.7.2.4 Spectroscopy

Spectroscopic examination of blood is convenient and useful. The test is usually carried out microscopically.

The blood haemoglobin is changed in two or three forms on the slide itself and characteristic absorptions are observed. Usually alkali haematein (obtained by treating the stains with ammonium sulphide) and cyanhaemochromogen (obtained by treating the above haematein with potassium cyanide) are studied for their characteristic spectra.

19.7.2.5 Spectrophotometry

Like some other methods, spectrophotometry can be used to identify blood. Absorption at certain wavelengths indicates the origin of the stain. Spectrophotometry is especially useful for disintegrated blood and when only small quantities of blood are available. Absorption in the

lower range (UV range) is more useful. Spectrophotometry has also been used to estimate the quantities of blood.

19.7.2.6 Chromatography

Ascending paper chromatography, using acetic acid, methanol and water solvent system has been employed to study the R_f values.

19.7.2.7 Electrophoresis

The electrophoresis techniques are of great importance. They are being used for the separation of various enzyme systems. They are used to study the body proteins. They are indispensable in DNA profiling to individualise humans and to identify animal species.

19.7.2.8 Colour Tests

Colour tests are the first series of tests employed after the location of the stain. If a questioned stain gives positive colour reactions in any two colour tests, the stain is possibly a bloodstain. If it fails to give colour reactions, in all probability it is not a bloodstain.

All these tests are highly sensitive and simple. Even an investigating officer can perform the test at the site himself. The tests are:

a. **Benzidine test**; The reagent is a solution of benzidine (0.1g.) and dry sodium perborate (0.2 g.) dissolved in glacial acetic acid (10 ml). It is sprayed over the stain. Appearance of deep blue colour indicates blood.

b. **Leucomalachite Green test** The reagent is a solution of leucomalachite green (0.1 g), sodium perborate (0.3 g) in 65% glacial acetic acid. When the reagent is applied to the stain, intense green colour if it is a bloodstain.

c. **Phenolphthalein test;** the reagent is reduced phenolphthalein (1 g) and sodium perborate dissolved in acetic acid (100 ml.). On application to the stain pink colour formation indicates blood.

19.7.2.9 Luminol Test

The preparation and application of luminol has already been described above.

All colour reactions, excluding luminol, are likely to make the bloodstains unfit for other confirmatory tests. Therefore, a small amount of bloodstain is taken up by pressing a wet filter paper to the stained area. The picked up stain is tested for blood. Alternatively, a small amount of stain is scraped on to a watch glass and tested.

Control tests, to check the substrata, are carried out simultaneously under identical conditions.

19.7.2.10 Crystal Tests

Two crystal tests are commonly employed. They are specific for blood but they are not sensitive. They often fail if the conditions are not rigidly controlled, or, if the blood is disintegrated or contaminated.

1. **Teichmann Test:** A dry crust or smear of blood is taken on a slide, treated with a drop of a solution of potassium iodide, bromide or chloride (0.1 g) in glacial acetic acid (100 ml). It is covered with a cover slip. On warming, it gives out bubbles if it is blood.

Typical haemin crystals are observed under the microscope. Heating may have to be repeated a number of times.

2. **Takayama Test:** The Takayama (Hemochromogen) test uses Takayama reagent which is a solution of the following:
   - One volume (say 10 ml) of glucose solution (10%),
   - One volume of potassium hydroxide solution (10%),
   - One volume of pyridine, and
   - Two volumes of deionised Water

   On warming, the dry blood-crust with the reagent gives characteristic crystals.

   Takayama test is specific for haemoglobin. The reagent forms insoluble, pink, needle-shaped crystals of hemochromogen. The main reactions involved are:
   - Sodium hydroxide releases the heme from the globin through alkaline hydrolysis.
   - Glucose reduces the heme iron, and
   - Pyridine combines with it to form the product, pyridine ferroprotoporphyrin.

19.7.2.11 The Precipitin Test

The test identifies the species of the bloodstains. It is a very delicate test and requires only small amounts of blood.

Antisera for human and common animals are prepared by injecting human or animal blood in rabbits (or other animals or birds) periodically, a number of times. When sufficient immunization has taken place, the animal is bled and its serum is collected. The serum contains antibodies relating to the blood injected.

When the anti-serum is brought in contact with corresponding blood, precipitate is formed at the point of junction. The white precipitate identifies the same species.

The reaction is performed using a sample, micro and capillary tubes, cavity slides or tiles having cavities. The precipitin reaction can also be carried out by electrophoresis. The most convenient mode is, however, the gel diffusion technique. Agar gel is spread over a microscope slide and seven wells are created in the gel, one in the centre and six in the six corners of a hexagon. The sample to be tested is placed in the central well. Antisera for different species are placed in the six wells. The antigen and antibodies are allowed to diffuse first in an incubator and then at room temperature. White precipitate is formed in the gel where the antigen sera meet the corresponding antiserum, which identifies the species of the questioned blood sample.

No precipitate is formed with other antisera. Control tests with blank and known blood are carried out under similar conditions.

A dilute blood solution is used for precipitin reaction. The antisera are not diluted. The blood solution and anti-sera should be free from turbidity and contamination.

The precipitin test is highly sensitive, specific and rapid. Bloodstains as old as fifteen years gave a positive reaction. Tests performed on Egyptian mummies (about 5000 years old) were also positive.

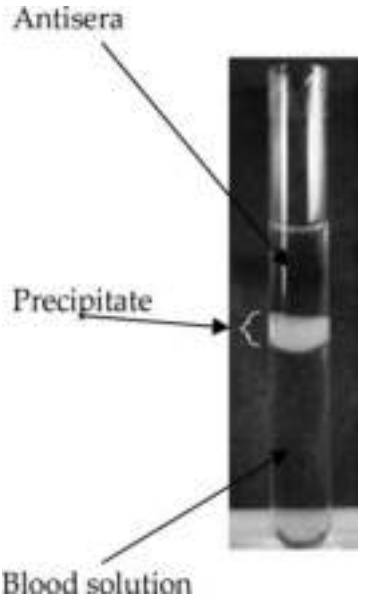

Fig. 19.7
Precipitin Reaction

19.7.2.12 Blood Grouping Techniques

Blood grouping techniques depend upon the existence of antigens and antibodies in human blood. There are two antigens and two antibodies which divide the blood into four groups. Their distribution is given in the table below:

The reactions of the antigen and antibodies permit the identification of the blood groups.

Table 19.2

Anti-body – Antigens Reactions

Antibody	**Antigen**			
	O	**A**	**B**	**AB**
Anti-A	–	+	–	+
Anti-B	–	–	+	+
Anti-A &Anti B	–	+	+	+
Anti-H (from Gorse)	+	–	–	–

Note: + =Agglutination; – = No agglutination.

A number of techniques are used to carry out the antigen-antibody reactions. In the past few decades very sensitive methods have been developed by which blood attached to even one millimetre long fibre of ordinary cotton cloth can be successfully grouped. The techniques vary and it is beyond the scope of this book to discuss them in detail. Besides the DNA profiling reduced the utility/use drastically

Direct methods involving mixed agglutination, or absorption-elution techniques are more popular. They are simple in principle and practice, but need experience. They may give unsatisfactory results with novices.

19.7.2.13 Mixed Agglutination

The antigen of the questioned sample is flooded with antisera. Excess is removed after some time by washing. Known indicator cells are then introduced. The indicator cells corresponding to the original antigen get attached.

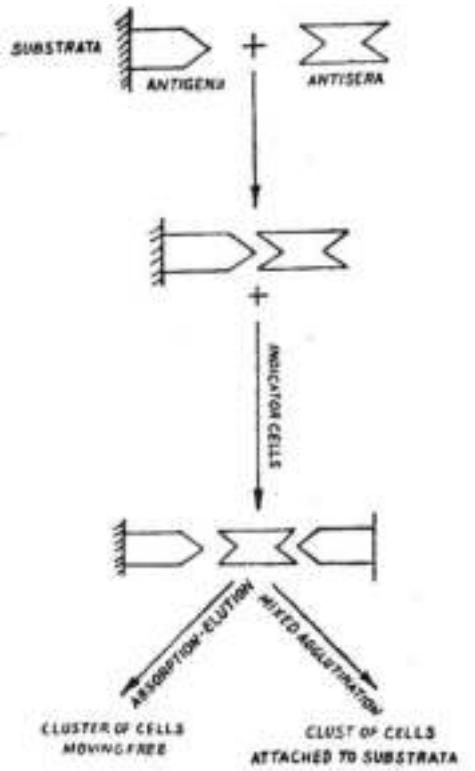

Fig. 19.8
Schematic representation of antigen-antibody reaction in absorption-elution and mixed-agglutination techniques

19.7.2.14 Absorption-elution Method

Absorption elution method involves the following steps:

1. Prepare Anti-A, Anti-B and Anti-H sera of 1: 256 to 1: 512 titre value.
2. Prepare 0.5% cell suspension of A, B and O cells.
3. Fix stain-bearing thread (2-3 mm) on a cellulose acetate sheet along with known blood stains and control cloth fibre, with an adhesive.
4. Add one drop of appropriate anti-serum on each thread.

5. Incubate in a moist chamber at 4° C for 12 hours.
6. Wash off the excess anti-sera with cold saline 6 times.
7. Blot dry the sheet with filter paper.
8. Add one drop of 0.5% indicator cells to each thread.
9. Incubate the sheet at 56° C for 15 minutes in moist chamber.
10. Rotate the sheet for 30 minutes and read the agglutination under a microscope. If cells of group 'A' are agglutinated, the original blood belongs to group 'A' if cell of 'B' group are agglutinated, the original sample is of group 'B' and so on.

Kind has suggested a slightly modified method for the same.

Absorption-elution technique is useful for the detection of A, B, H, M, N, and other antigens.

The following points are kept in view:

1. The original sample is properly fixed.
2. Absorption should take place at optimum conditions. High temperature may denature the antigen and prevent absorption.
3. The antisera should be of correct strength (avidity).
4. Proper washing is needed. Excessive washing causes elution while in-complete washing does not remove the antisera completely.
5. Indicator cells should have a low concentration (less than one per cent.)

In micro techniques, still lower concentrations are used.

19.7.2.15 Blood Grouping from Antibodies

Blood grouping is usually carried out with the antigens present in the bloodstain. But antibodies can also be used for the purpose.

Antibodies are labile and are destroyed comparatively more easily. When fresh blood is available in sufficient quantity, antibodies in the serum can be used similarly in antibody-antigen reactions.

19.7.2.16 Pitfalls

There are many pitfalls in blood grouping including the following:

1. **Imperfect Antisera:** Imperfect antisera will give misleading results.
2. **Auto-agglutination:** Auto-agglutination is clump formation in the blood extract without adding the antiserum. This can be due to many reasons.
3. **Pseudo-agglutination:** Pseudo-agglutination is the apparent clumping of cells when cell concentrations or serum strength is more than required. On dilution the clumps break up. The blood behaves normally.
4. **Bacteriogenic Agglutination:** Bacteria may cause bacteriogenic agglutination. If blood samples or their solutions are kept in a humid climate and at appreciable temperature the bacterial growth takes place which gives non-specific reactions.
5. **Atypical Antibodies:** Atypical antibodies are found only in a few blood sera. They interfere in the antigen-antibody reaction.

In view of the above, it is essential that blood grouping is carried out under optimum conditions and in addition to using duplicate samples, control and blank samples must also be used. The high sensitivity of the methods requires the highest degree of cleanliness and strict control of the reaction conditions.

19.8 SPECIAL PROBLEMS

19.8.1 Foetal Blood

Foeticide is a serious problem in India. Identification of the foetal blood assumes importance to fix the guilt of the culprit. Foetal blood has Y peptide, which is not present in venous blood of the grown up person. Its identification identifies the foetal blood. The y peptide is identified with anti-sera for foetal blood.

19.8.2 Menstrual Blood

Menstrual blood has the property that it does not coagulate to form clots because the fibrinogen in the blood gets degrades. The identification of the degradation products identifies the menstrual blood. Alternatively, it can be identified from the presence of proteins LDH 4 and LDH 5 which are not present in the venous blood.

19.8.3 Blood in Debris

Dust and debris may contaminate blood. It can be tested only after purification. The technique evolved for the purpose is:

The debris is placed in a beaker and covered with water. A filter paper strip is placed vertically with the lower end dipping in the water contained in the container. Blood solution moves up due to capillary action. It gets concentrated near the upper end of the paper strip. The blood, thus recovered, is examined and tested.

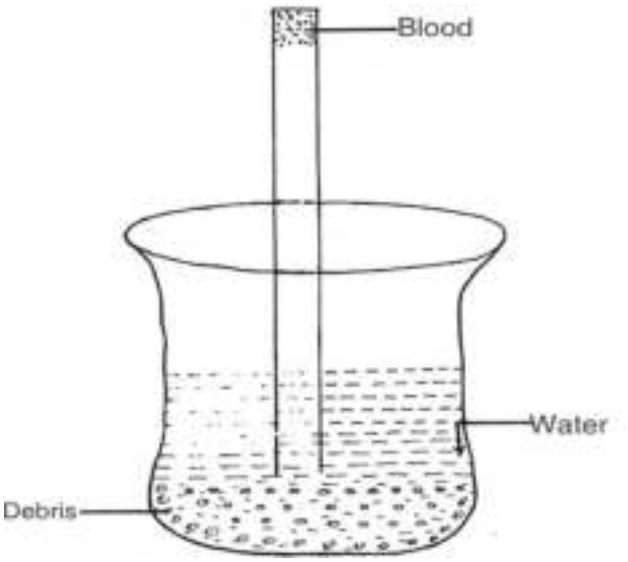

Fig. 19.9
Blood from Debris

19.8.4 Age of bloodstains

The colour and appearance of blood change with time. Also, blood diffuses in permeable surfaces. The extent of diffusion and the colour change can give some idea of the age of the stain.

19.8.5 Disputed Paternity

Cases relating to disputed paternity were not frequent in India due to social, cultural and religious customs and beliefs. Now the number of such cases is increasing.

Blood groups in children are inherited from their parents according to Mendelian hereditary law. Consequently, if blood groups of father and mother are known it is possible to ascertain what could or could not be the possible blood groups of the child in most of the cases. For example, if the father and mother belong to the group 'O', the child has to be of group 'O' only. He could not have A, B or AB blood group.

Table 19.3
Blood Group Inheritance[5]

S. No.	Parent 1	Parent 2	Child
1	A	A	A, O
2	A	B	A, B, AB, O
3	A	AB	A, B, AB
4	A	O	A, O
5	B	B	B, O
6	B	AB	A, B, AB
7	B	O	B, O
8	AB	AB	A, B, AB
9	AB	O	A, B
10	O	O	O

Antigens M and N are also inherited like antigens A and B.

M, N and MN type of a child can thus further help to include/exclude paternity.

Table 19.4
M-N Types and Heredity

S.No	Parent type	Children types
1	M and M	M
2	M and N	MN
3	M and MN	M, MN
4	N and N	N
5	N and MN	N, MN
6	MN and MN	MN, M, N

5. It is based on Mendelian law of inheritance. In some rare cases, the law is not obeyed.

Human Leukocytes Antigen (HLA) test has also been utilised for determining paternity. It involves certain antigens found in white cells. If the HLA test is positive, the chances of the person being father are 90%. A, B, O grouping increases the probabilities further. However, the use of DNA is more accurate in determining paternity. It is now being used universally. It is also more expensive than HLA typing.

We now know that they are determined by genes on chromosome 9, and they do not change as a result of environmental influences during life. An individual's ABO type results from the inheritance of 1 of 3 alleles (A, B, or O) from each parent.

Rhesus factors in blood have also been utilised in disputed paternity cases. However, the techniques especially the preparation of antisera is cumbersome, which has prevented the general use of these factors in paternity cases.

The paternity tests discussed above are now only of academic interest. DNA profiling offers better and infallible determinations. It is used all over the world almost invariably for the purpose, now.

19.8.6 Secretors

The discovery of blood group substances in other body fluids such as saliva, mucus, semen etc. has extended the field of serology. About eighty per cent of the human population secretes blood group substances in their secretions. Saliva and semen are especially rich in these substances. They contain about four times these substances as compared to the blood of the same volume. The substances are water-soluble and are interfered by cellular material present in the secretions. They are grouped by the mixed agglutination techniques.

A person, who secretes the blood group factors in his body fluids, is called a secretor, the one who does not, is called a non-secretor.

A lady passenger, found unconscious in a first class railway compartment, was removed to hospital where she was declared 'brought dead'. A few small bloodstains on her clothes were of, group A, while her own blood group was B. Only one of the four suspects had blood of group A. Saliva on the cigarette stubs found in the ashtray in the compartment was also of A group. (CH)

19.8.7 Miscellaneous

1. **Parts of the Body;** it is sometimes necessary to know from which part of the body the blood has come. It is possible only if the blood is found contaminated with particular secretions, hair or skin from the part of the body having identifying features. For example, nasal blood is identified through nasal mucus. Similarly, menstrual blood is identified from the presence of degradation products of fibrinogen.
2. **Quantity of blood shed;** it is estimated from the dried blood, which is found at the spot.
3. **Bloodstain spatter pattern;** it is useful to reconstruct the sequence of occurrence. The blood drops can lead to the place or places visited by the injured victim or the culprit.
4. **Presence of disease**; its determination may authenticate the claim for diminished responsibility for the death of the victim. The disease organisms are examined microscopically, by staining techniques and by biological methods.
5. **Presence of poison/intoxicants**; the presence of alcohol, carbon monoxide and other poisons in the blood are important clues in criminal investigations. They have already been discussed above.

19.9 PRESENTATION

The presentation of blood evidence does not offer any particular problems. Forensic Serologist presents it in the form of a report, which is admissible under section 293 of the Code of Criminal Procedure, 1973 of India. The court can, however call the Serologist for personal presentation; or for further elucidation, etc.

The presentation of blood evidence has the following important aspects:

1. The discovery and recovery of the evidentiary clues
2. The relevancy, authenticity, Integrity and intact chain of custody
3. The techniques of evaluations used in the analysis are standard and accepted by the serology fraternity.
4. Both positive and negative evidence considered
5. The report emanates from a qualified/dedicated/experienced and honest Serologist
6. Conclusions based upon generally accepted standards and adequate data
7. Adequately illustrated and convincing presentation

The investigating officer presents the discovery and recovery of the clue materials. He proves that the recovery of the evidence has been done with all the legal formalities, that the evidence is relevant, that its identity and integrity are beyond reasonable doubt and that its chain of possession is intact. He may support his proof with sketches and photographs wherever necessary. He produces seals, documents and identification marks to establish the true identity and intact chain of possession for the whole period.

The serologist uses and indicates that he has used the latest recognised tools and techniques and generated adequate and proves that the data produced is standard, recognised by the professionals in the field as sufficient to arrive at the conclusions he has arrived at.

The report he produces, has naturally to be concise. But it must be precise and intelligible. It contains details relating to the nature of the exhibits, their number, their description, etc. He describes briefly, the tests carried out, the observations made and the conclusions arrived at. He identifies the exhibits through his initials and marks, when required.

The presenting counsel organizes the presentation in an orderly way; the defence counsel brings out the lacunae, if any. The court ensures to get the whole truth and nothing but the truth. He maintains the decorum of the court.

19.10 CASE LAW

19.10.1 Taking Samples of Body Fluid[6]

Author's Summary

The defence took the plea that taking or examination of blood/semen is not covered under section 53 and it is against Article 20(3) of the constitution. The Court rejected the plea.

Highlights italicised

Relevant Extracts (Verbatim)

> The further objection of Sri Ayyapu Reddy was that taking samples of blood and semen does not come within the scope of examination of the person of the arrested person. The

6. *Ananth Kumar Naik v State of Andhra Pradesh*, 1977 Cr LJ 1797 : (1977) 2 Andh WR 437 : 1977 Mad LJ (Cri) 514.

said words take in only physical examination of the body. I cannot agree. Examination of a person by a medical practitioner must logically take in examination by testing his blood, sputum, semen, urine, etc. To a question put by me,

Sri Ayyapu Reddy has said that taking an x-ray photograph or electrocardiograph is not excluded from the examination of the person of the arrested person. When that much is conceded, I see no reason why the examination of blood and semen is outside the scope of section 53.

In B. Rami Reddy v State of Andhra Pradesh,[7] *Madhava Reddy, J. held that the signature of an arrested person can be taken for comparison and article 20(3) of the Constitution does not stand in its way.*

Justice Ramachandra Raju likewise held in M. Narayanaswami v V. Yangatanna,[8] *that taking thumb-impression of an arrested person is not precluded by a Article 20(3).*

For these reasons, I cannot agree that the impugned direction that the blood and semen samples of the petitioner should be taken comes within the mischief of testimonial compulsion.

The next argument was that taking samples of blood and semen inflicts torture and pain on an under trial prisoner and it was tantamount to an offence against the accused. It was further argued that there was no provision in the Code of Criminal Procedure to compel undertrial prisoner to give samples of blood and semen.

What I have stated above shows that under sections 53 and 54 of the new Code there is such a power. In fact section 53 provides that while making such an examination such force as is reasonably necessary for that purpose may be used. Therefore, whatever discomfort that may be caused when sample of blood and semen are taken from an arrested person it is justified by the provisions of sections 53 and 54, Code of Criminal Procedure.

19.10.2 Bloodstains[9]

Author's Summary

The identification of bloodstains was corroborated by a plethora of other evidence, bloodstained knife and bush shirt and extra-judicial confession.

Highlights italicised

Relevant Extracts (Verbatim)

Furthermore, their identifications are corroborated not only by the evidence of Takalya to whom the appellant had made an extra-judicial confession, but also by the evidence of the recovery of a blood stained knife and a blood-stained "bush shirt" at the pointing out of the appellant. The appellant had also some injuries on his person which had resulted from the scuffle. Their duration coincided with the time of the occurrence. He had also some bloodstains on his clothes which he could not explain.

The bloodstains on the objects mentioned were of the same group as either that of the deceased or of his wife. The accused's blood grouping is different. After examining the whole evidence, there is not a shadow of doubt left in our minds that the appellant had committed the dastardly attack.

19.10.3 Blood Group Identifies the culprit[10]

It will be recalled that head constable Gajanan Salokhe seized bloodstained shirt (article 1), handkerchief (article 2), "Banian' (article 3) and half pant (article 4) from the person of the appellant and also took clippings of his nails (article 5) as they were also suspected to be stained

7. (1971) 2 Andh WR 94 : (1971) 2 AP LJ 174 : 1971 Cr LJ 1591 (AP).
8. AIR 1975 AP 88 : (1974) 2 Andh WR 365 : ILR 1975 AP 578.
9. *Ramesh Ramdas Teli v State of Maharashtra*, AIR 1976 SC 345.
10. *Rau Chima Chougule v State of Maharashtra,* AIR 1977 SC 2407 : (1977) 4 SCC 518 : 1978 Cr LJ 14.

with human blood. As has been stated the chemical examination showed that while the appellant's blood was of "A" group, the blood of his son-in-law Shivaji was of "AB" group and the blood of his daughter Vijaya was of "A" group. The appellant's short and the clippings of his nails were found to be stained with human blood of "B" group, while his half pant (article 3) was found to be stained with human blood of "A" group. The High Court was therefore quite justified in reaching the conclusion that it was the appellant who had committed the two murders.

19.10.4 Presence of bloodstains on clothes corroboratory evidence[11]

Then there is also the evidence of recovery of bloodstained clothes from accused Nos. 1 and 3. The clothes were found stained with human blood and the explanation given by accused Nos. 1 and 3 for the presence of blood on the clothes can hardly be said to be convincing. Of course, this cannot be regarded as a conclusive piece of evidence for incriminating accused Nos. 1 and 3, but it is certainly a piece of evidence which goes to support the other evidence about the guilt of accused Nos. 1 and 3.

19.10.5 Recovery of Bloodstained Kassi[12]

For raising a presumption of guilt against the accused for offence of murder the ownership of the weapon of offence cannot be said to be of much importance. The matter of consequence is possession and its use by the accused. When accused failed to give an explanation for his possession of the bloodstained "Kassi" (spade) a weapon, which if used against the deceased could have caused the injuries found on her person, notwithstanding that the bloodstains found over it had not been established to be of human blood, yet

Its recovery construed a strong circumstance against the accused, 1972 Cr LJ 744 (SC); 1959 Cr LJ 90 (SC) and 1956 Cr LJ 790 (SC) relied on.

The evidence of identification of an article at the trial is the substantive evidence and the identification of the same article by the same witness, at the time of test identification, is only a corroborative piece of evidence.

19.10.6 Blood Trail[13]

Author's Summary

The defence version that the victim was injure somewhere far away from the house where blood trail was found. The finding of the doctor that the victim could not walk to reach the house negated the version. He carried to the place while still alive Dripping blood created the train

It was argued with great vehemence in the High Court as well as in the Court of Sessions that there was a trail of blood from the front door of the house of the vakil into the rooms marked H in the plan and that supported the defence theory that the deceased Kannan received the stab injuries not in or near the house in question but somewhere far away near the railway station. The High Court took the view that if Kannan had received the injuries somewhere outside the house it is impossible for him to have come into the room in view of the doctor's evidence.

11. *Namdeo Daulata Dhayagude v State of Maharashtra,* AIR 1977 SC 381 : (1976) 4 SCC 441.
12. *State of Rajasthan v Nanu Ram*, (1978) Cr LJ (NOC) 80.
13. *Marachalil Pakku v State of Madras,* AIR 1934 SC 648 : 1954 Mad WN 670 : 1954 Cr LJ 1668 (SC).

It was concluded on the material placed on the record that there could be no room for doubt that Kannan received injuries in the room itself and not outside, and that he was carried out of the room while life was still lingering and therefore there would be dripping of the blood from the body during the course of transit as the injuries were very serious and vital arteries had been cut.

19.10.7 Blood Pool[14]

Author's Summary

The facts that though the victim had 2 injuries, there was no blood at the site where body was found, nor on the cot which was used to carry the victim; nor there was any blood trail anywhere, indicated that the crime scene was fake.

Relevant Extracts

The evidence shows that although two injuries were caused and one of the questions which had been raised by the defence was that there was no blood at the spot, no attempt was made by the prosecution to show the reason why there was no blood at the spot. It is significant to notice that blood was not found at the spot. There was no blood on the cot on which the dead body of Chaggar Singh was carried, nor was there blood in the compound where the dead body was lying nor a trail of blood to the house.

The learned judge was not satisfied that the occurrence actually took place near the '*Haveli*' of Dial Singh.

19.10.8 Collection[15]

Author's Summary

The court rejected the evidence of the bloodstained article because they were not sealed and sent immediately to the laboratory. It created element of manipulation/padding.

Relevant Extracts

1. I would have attached great importance to the evidence of the imperial serologist in regard to the detection of blood-stains on the trousers and the shirt which the appellant was wearing at the time when he was arrested, but I feel impressed by the argument advanced by the learned counsel appearing as *amicus curiae* in this case that the delay in dispatching these articles to the chemical examiner and the absence of the evidence that these articles were sealed and despatched in the presence of the appellant and respectable witnesses is fatal to the prosecution so far as this point is concerned. As has been indicated in paras 2 and 4 above these articles were seized from the person of the appellant on evening of 17th Phagan 2006 at Thana and they were packed, sealed and despatched to the chemical examiner on 22nd Phagan, *i.e.*, six days after they had remained in the possession of the police. Where is the guarantee that these clothes were not tampered with during this long interval? In a similar case reported in [J&K LR 37 (A)] the learned Chief Justice, the late Mr. Justice Rachhpal Singh observed as follows at page 42.

In a case like this what happens generally is that the police immediately in the presence of witnesses takes possession of the articles containing bloodstains and at once seals them so that it is not open to the accused to come out with the defence that these bloodstains might have been

14. *State of Punjab v Behari Lal Pahu Lal*, AIR 1953 P&H 218 : 55 Punj LR 221 : 1953 Cri LJ 1427.
15. *Abdul Salam v State of Jammu and Kashmir,* 1953 Cr LJ 1865 : 10 J&K LR 94.

placed there by the police. In the present case the door leaves were for several days in the custody of the police and it is possible that somebody connected with the prosecution might have placed these stains on them.

The observation is fully applicable to this case. The learned counsel for the appellant has rightly drawn our attention to this glaring defect and I am afraid it would not be correct to exclude the possibility of the stains having been put subsequently on the clothes in this case. As it is, these stains cannot furnish any corroboration of the retracted confession. Apart from it, the appellant had more than 24 hours to wash his clothes and remove the stains. It is not the prosecution story that the idea did not occur to him. On the other hand the story for the prosecution is that the appellant had washed his *Loi*, Ex. P. 3, during the interval. It is therefore strange that he should not have washed his shirt and trousers and wandered about with these clothes on.

19.10.9 Relevancy[16]

Author's Summary

The chemical examiner, in a murder case, found bloodstains on the clothes recovered from the house of the suspect. However, the Serologist failed to identify the stains as human bloodstains. Stains provided no evidence!

Relevant Extracts (Verbatim)

The discovery of a blood-stained piece of cloth from the house of the appellant leads to no conclusion against him on the charge of murder. While the chemical examiner found blood on it, the imperial serologist could not say that it was human blood. The discovery of one or more dhotis with some stains of blood which are not ascertained to be human blood, five months after the alleged murder cannot be stated to be evidence of murder against the appellant. The Sessions Judge was quite right in observing that if some bloodstains are found on clothes of persons engaged in cutting roots and working in the jungle they cannot be put down as evidence of murder. The *dhoti* seized from the appellant's brother, Motiram was not even found in the possession of the appellant. Under the circumstances, the evidence classified under the fourth head is of no assistance to the prosecution.[1]

19.10.10 Blood Group establishes incident at the spot[17]

Author's Summary

The presence of the blood groups belonging to the injured and the deceased on the various exhibits lifted from the spot conclusively establishes that the incident had taken place at the spot from where the exhibits were lifted.

The FSL reports show that human blood of 'B' Group was detected on gauze cloth piece (lifted from the spot); human blood of 'AB' Group was detected on gauze cloth piece (lifted from the back tyre of motorcycle); human blood was detected on cemented piece (blood stained earth); blood was detected on control cemented piece (earth control); human blood was detected on shirt (shirt of accused); human blood of 'AB' Group was detected on Baniyan (Baniyan of injured); human blood of 'AB' Group was detected on shirt (shirt of injured); human blood

16. *Tulsiram Karu v State*, AIR 1954 SC 1 : 1953 SCJ 612 : 1954 Cr LJ 225 (SC). See also *In re Periyaswami Theven*, AIR 1950 Mad 714.
17. *Anil Kumar v State,* 2018 (4) ADR 168.

of 'AB' Group was detected on pants (pants of injured); human blood of 'AB' Group was detected on handkerchief (belonging to injured); human blood of 'B' Group was detected on Baniyan (belonging to deceased); human blood of 'B' Group was detected on pant (belonging to deceased; human blood was detected on shirt (belonging to deceased) and human blood of 'B' Group was detected on gauze cloth piece (blood sample belonging to deceased). It therefore stands established that the blood group of deceased was of 'B' Group and of the injured was of 'AB' Group. The presence of the blood groups belonging to the injured and the deceased on the various exhibits lifted from the spot conclusively establishes that the incident had taken place at the spot from where the exhibits were lifted.

19.10.11 Blood grouping not established — Significance of medical evidence[18]

Author's Summary

On a serological analysis of jeans, though human blood was detected, but the blood grouping could not be established. However, the forensic evidence cannot be examined in isolation. The medical evidence is also of great significance.

Relevant Extracts (Verbatim)

It has been argued on behalf of the appellants that the trial court failed to consider the fact that the FSL report is in favour of the appellant. It is a matter of record that on a serological analysis of the jeans of the appellant, though human blood was detected, but the blood grouping could not be established. In other words, due to "no reaction", the human blood of group 'B' found on the clothes of the deceased, could not match with the blood on the jeans of the appellant. Similarly, though human blood was found on the weapon of offence, i.e., knife, there was "no reaction" as to the blood group. However, the forensic evidence cannot be examined in isolation. The medical evidence is also of great significance. In the instant case, the doctor, who had proved the post-mortem report, has opined that the death was homicidal, caused by the severe injuries on the person of the deceased. The severe injuries on the body of the deceased as recorded in the medical evidence lends credence to the testimony of the eye witness, as to the ruthless manner in which the deceased was done to death by the accused persons.

19.10.12 Slovenly Reports[19]

Author's Summary

Courts found the reports of the chemical examiners slovenly/perfunctory. They gave guidelines to write proper reports; to avoid miscarriages of justice.

Relevant Extracts (Verbatim)

The chemical examiner's report about the bloodstains is slovenly and perfunctory and we have noticed with regret the same slovenliness in the reports of other chemical examiners in some other cases that have come before us. *The chemical examiner's duty is to indicate the number of bloodstains found by him on each exhibit and the extent of each stain unless they are too minute or too numerous to be described in detail.*

18. *Himmat Singh v State (Government of NCT),* 2019 (3) ADR 562.
19. *Prabhu Babaji Navle v State of Bombay*, AIR 1956 SC 51 : 1956 Cr LJ 147.
Also See: *Ramprashad v The State of Bhopal*, AIR 1953 Bho 17 : 1953 Cr LJ 702.

Merely to say that blood was detected on an exhibit, as this report states, is not enough. It may well lead to miscarriage of justice compelling judges to acquit when they would have convicted had the report been more revealing. We trust these observations will be brought to the notice of all chemical examiners in this country. Not that they all act like this. Many give full and detailed reports as they should.

19.10.13 Disputed Paternity[20]

Author's Summary

The case discussed in this judgment is old, somewhat redundant. The DNA technology provides definite answer, either way, in disputed paternity. Further, Case Law permits taking of blood samples for determination of paternity. ND Tewari's (a prominent politician of UP) case has cleared the law point.

Relevant Extracts (Verbatim)

The points for exposition in this revision are five in number *viz:* (a) technique of blood test; (b) the value of blood test; (c) the law on this subject in various countries; (d) how far such order could in criminal cases be held to be testimonial compulsion offending article 20(3) of the Constitution; and (e) how far this compulsory blood test can be extended to proceedings under section 488, Code of Criminal Procedure.

Point (a): The blood group of a person is determined by the characters which it contains. It must contain at least one character of each set and the characters are inherited according to fixed rules. A child cannot have a character which he does not inherit from one or other of his parents.

The technique of this blood grouping has been developing with the passage of years, and a vast literature on this subject has now sprung up. The gist of which can be studied in the authoritative treatises on medical jurisprudence and cannot be further dealt with here.

Point (b): The value of the test is however limited. Glaister has the following to say:

> *Its use for the determination of paternity is of value on account of the Mendelian inheritance of the individuality of the blood by the offspring of a given mating. Although the true father can never be definitely identified by the test, it can frequently be asserted that a certain man could not be the father of the child in question. A man who fails in repeated blood grouping tests can definitely, and without doubt be eliminated as the father. The test is also of importance when a child is claimed by two sets of parents.*

Gonzales, etc. states:

> *The tests, however, have their limitation; they may exclude a certain individual as the possible father of a child but they cannot possibly establish paternity. They can only indicate its possibilities. Another man with the same group as the father could be responsible for the child in question.*

Lyons had the following to say:

> *The negative finding is definite while positive finding indicates a possibility only. It can be stated definitely that Master Tom is not the son of Mr. Smith. It cannot be stated equally definitely that he is the son of Mr. Brown. That he can be the son of Mr. Brown is all that can be stated on the positive side. The remarks apply to Mrs. Smith and Mrs. Brown regarding motherhood.*

Wigmore on Evidence (3rd Edn.) in Vol. I, section 165A, (p. 610 and following) sums up blood groups as evidencing paternity, as follows:

> *In one specific biological trait, viz., blood-groups, scientific opinion is now in accord in accepting the fact that there is a causative relation between the trait of the progenitor and the trait of the progeny. In other words, the blood- composition of a child may be some evidence as to*

20. *Subayya Gounder v Bhoopala Subramanian*, AIR 1959 Mad 396 : (1957) Mad LJ (Cri) 822 : 1959 Cr LJ 1087 (Mad).

> *the child's paternity. But thus far this trait (in the present state of scientific discovery as generally accepted) can be used only negatively, i.e., to evidence that a particular man is not the father of a particular child C. The biological data that permit this inference are complex..... The progress of science will no doubt make it possible from time to time to increase the range of the cases that afford decisive proof, both negative and affirmative. Already, by judicial decision or by statute, the law has accepted the use of blood-group composition to evidence paternity negatively, – of course, only when testified to by a qualified expert.*

Point (c): The law on this subject in various countries can be studied from the valuable monograph published by Schatkin on '*Disputed Paternity Proceedings*'. 3rd Edn., Second Reprint 1956 (U.S.A.) (Mathew Bender and Co. 443, Fourth Avenue, New York, N.Y.) in Chapter VIII (p. 193 and following): In the United States of America, New York was the first state to authorise blood test in disputed paternity cases (Laws of 1935, Chapters 196, 197, 198, in effect March 22, 1935; as amended by laws of 1930, Ch. 439, section 1, in effect May 4, 1936). Nine other states have followed suit. All ten statutes are substantially the same. It runs as follows:

> *Whenever it shall be relevant to the prosecution or the defence in an illegitimacy action, the trial court, by order, may direct that the complainant, her child and the defendant submit to one or more blood tests to determine whether or not the defendant can be excluded as being the father of the child. The result of the test shall be receivable in evidence "but only in cases where definite exclusion is established. The test shall be made by a duly qualified person, or persons, not to exceed three, to be appointed by the court and to be paid by the country. Such experts shall be subject to cross-examination by both parties after the court has caused them to disclose their findings to the court or to the court and jury. Whenever the court order such blood tests to be taken and one of the parties, shall refuse to submit such test, such fact shall be disclosed upon the trial unless good cause is shown to the contrary.*

Brief as it is, the above statute covers the following important points:

a. The result is admissible in evidence only when the exclusion is established.
b. The expense of the test is made a county charge.
c. The test may be performed, not only by a physician, but also by any qualified pathologist.
d. The refusal of the mother (or defendant) to submit to the test may be drawn to the court's attention.

In Denmark, since 1937 the test has been compulsory by statute in affiliation cases, and it is today ordered as a routine matter in such cases. In Germany, prior to the Nazi regime, an average of 10 per cent of the children born each year were illegitimate, and under the aegis of National Socialism, this proportion no doubt increased. All children born out of wedlock are by operation of law automatically placed under State Guardianship. Under German law the defendant in an affiliation suit is presumed to be the father of the child if it is established that he cohabited with the mother during the statutory period of conception. This statutory period of conception lies between the 181st and the 302nd day (both inclusive), preceding the birth of the child. There are only two defences available to the accused (1) that conception by him was "obviously impossible under the circumstances (for example, if he can show that he was sterile); and (2) he may raise the legal defence of exception plurium that another man also cohabited with the mother during the legally critical period. In effect, therefore, the unwed mother in Germany is permitted to name two men successively as the father. If the defence is exception plurium, and the blood test excludes the other man, the defendant originally named will be adjudged the father. If the blood test excludes the defendant, suit may be brought against the other man. The courts of Soviet Russia have allowed blood tests since 1927, and today the positive result of the test there is regarded as absolutely conclusive proof of non-paternity. Incidentally, there is no longer any legal distinction drawn between legitimate and illegitimate children in Soviet Russia.

In Sweden, blood tests are compulsory and ordered as a routine matter in all affiliations.

As early as 1926, the Supreme Court of Austria accepted an exclusion as decisive of the issue of paternity, and acquitted the defendant.

In Canada, in *Morris v Gantous*, (1941) 47B de jur 150, the Quebec court held, in an opinion written in French, that it lacked the power to order the drawing of a blood specimen for the purpose of carrying out a blood test. (The Canadian Bar Review, May 1949, page 538).

In England, as pointed out in (1938) 185 LT 409 (A) or in other countries the courts have the power to order the tests to be done, but in this country they have not. English magistrates cannot take into account in any way an applicant's refusal to undergo a test. The test can only be done by consent. On July 6, 1938, Lord Merthyr introduced his Bastardy (Blood test) Bill in the British Houses of Lords, which, by its terms, was to have been effective on January 1, 1940. The Select Committee of that House reported favourably on the bill as follows:

> *The committee are unanimously of the opinion that the quantities of blood underlying blood grouping and the laws of inheritance governing the transmission of these qualities from parents to children are accepted by such a consensus of scientific opinion throughout the world as to render it desirable in the interests of justice for this knowledge to be applicable to affiliation cases.*

Due to the war all private members' bills were suspended and this bill was not enacted into law. Wherever courts in England have ordered blood tests it is only by consent.

In India, there is no special statute and there is no provision either in the Criminal Procedure Code nor in the Indian Evidence Act empowering courts to direct such a test to be made. Similarly as pointed out by Raghava Rao, J. in *Polavarapu Venkataswarlu v Polavarapu Subbayya*[21], there is no procedure either in the Civil Procedure Code or the Evidence Act which provides for a blood test being made of a minor and his mother when the father is disputing the legitimacy of the minor and held that if the parties are unwilling to submit to such a test the court has no power to direct them to submit themselves to such a test.

21. (1951) 1 Mad LJ 580 : AIR 1951 Mad 910 (1) : ILR 1952 Mad 150.

CHAPTER 20

SEMEN & OTHER BODY FLUIDS

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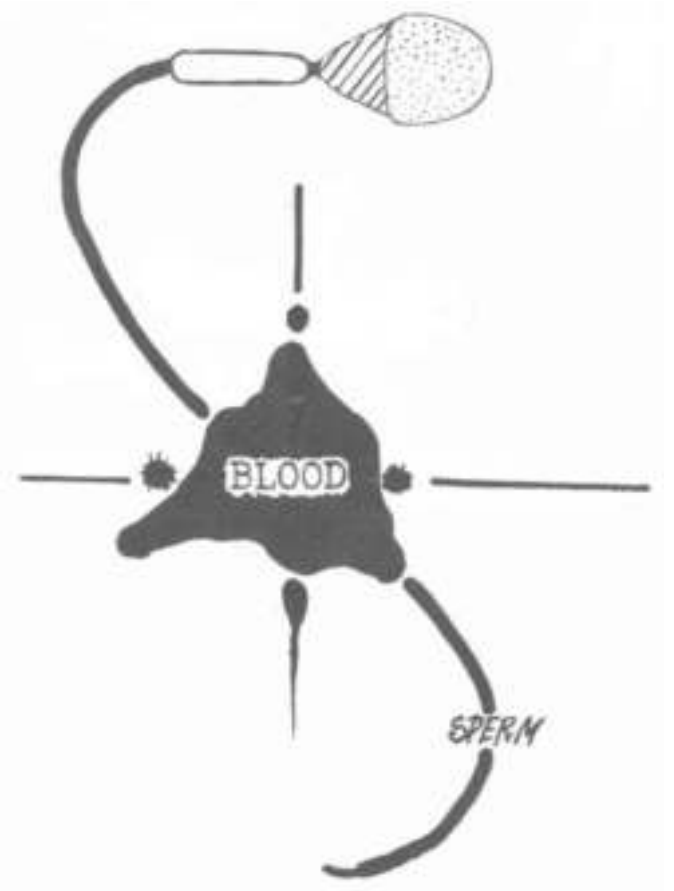

Fig. 20.1

20.1 SEMEN

20.1.1 Importance

Semen, as evidence, is involved in heinous crimes like rapes, rape-murders, child abuse, incest, adultery, indecent assault, and unnatural offences, such as homosexual offences, bestialities, indecent exposures, infidelity allegations in divorce cases.

Semen, like other physical evidence in offences against the person, including sexual assaults helps to:

1. Establish *corpus delicti*.
2. Identify the culprit/victim.
3. Eliminate the innocent suspect/accused.
4. Reconstruct the crime/sequence of events.
5. Verify the victim's/defendant's/correct version.

The investigation of offences involving rape and child abuse cases needs delicate handling.

20.2 NATURE

Fresh semen is a gel-like fluid. It has a characteristic smell. It liquefies on standing in air for some time. The liquid, on further standing, dries up; leaving a solid opaque and crusty residue, reduced to about seven percent of the original weight. In the dry state, it has no smell.

A normal man ejaculates about 3.5 ml of semen, in one ejaculation. The number of sperms in a normal ejaculation is about 30 to 50 million. The number varies from man to man. Age/health/food/disease/medicine/stress affect.

The semen of some person does not contain sperm (spermatozoa). The complete absence of sperms in semen is called azoospermia. Complete absence of semen in ejaculation is aspermia. It is the cause of infertility. The semen of sterilised (Vasectomised) male does not contain sperms. Their semen, however, produce normal amounts of seminal secretions which are can permit detection of semen.

Human sperm has a definite shape and structure, which is distinguishable from sperms of other species. Identification of sperm in the stain is considered a conclusive identification of semen. It has a tadpole-like structure **(total length ~0.05 mm).** Sperm is seen through a microscope.

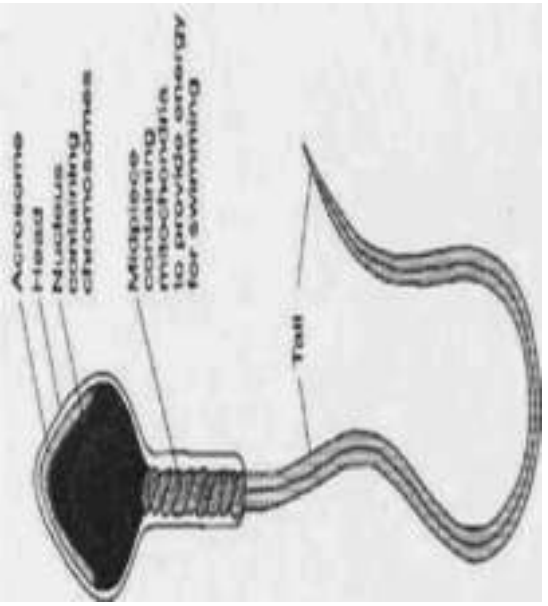

Fig. 20.2

Schematic (not to scale) Diagram of Sperm

Semen is a complex mixture of proteins, including blood group factors, choline, acid phosphatase, uric acid, and inorganic salts.

In comparatively recent years, vasectomy has become common in India. The semen of vasectomised persons does not contain sperms. Likewise, the ejaculation of aspermic persons does not contain semen/sperms.

Semen is easily destroyed. Exposure of the sample to factors, such as heat, humidity, oxidizing agents, and microorganisms (bacteria and mold) can affect semen. The evidence, therefore, needs prompt collection, preservation, and processing.

Sperm Detection/Collection Inhibitors

1. Delay in processing the evidence after assault
2. Destroying/secreting condom after use
3. Aspermic /azoospermic people
4. Victim's hygienic steps: (douching, bathing, gargling)
5. Chronic alcoholism depletes sperm stores
6. Degradation of seminal secretions
7. Physiologic activity (urinating, defecating, menses)
8. Trauma, congenital abnormalities, infections
9. Testicular irradiation, elevated scrotal temperature.
10. Drugs/toxins

20.3 EVIDENTIARY CLUES

Semen is the main piece of evidence in sexual assaults. Other biological and non-biological evidence (e.g., blood, fingerprints, track marks, and trace evidence) is ever present. It also helps to identify crime, criminal, victim, modus operandi. We discuss semen evidence only in this chapter. Other evidence has been discussed in other chapters.

20.3.1 Sources

The following are the usual clue material sources relating to semen:

1. The Victim

If a culprit has ejaculated in a sexual act, the victim carries semen on the following sites:

- In the vagina, anus, rectum or mouth (in case of oral intercourse) as the case may be.
- On pubic region, thighs, buttocks.
- On undergarments and other clothes.
- On hands, if they have not been washed.

2. The Culprit

- Sexual organs, pubic hair and thigh region
- Clothes especially undergarments, fly flaps of the trousers, the front flap of the shirt
- Handkerchief
- Materials used for wiping
- Hands, if not washed
- Nail scrapings may carry semen for a long time

3. The Scene of Occurrence

Semen is found at the crime scene at the following sites:

- As stains on beddings, floor, carpet, furniture, bathroom and lavatory, where the sexual act was committed.
- On discarded materials used for wiping i.e., clothes, paper or even leaves or grass which may have been used for the purpose.

- In outdoor scenes, it may be found on the ground, soil, grass or even on plants.
- If the scene of occurrence is a vehicle, semen may be found on the seats, on vehicle's floor, on the sides or on the curtains.
- Materials used for wiping, carrying semen, may be found inside the vehicle or at the spot where the vehicle was parked or thrown en route.

20.4 INVESTIGATOR'S ROLE

The IO has to locate, collect, preserve and process semen evidence, ensuring its identity, relevancy, integrity, authenticity and continuity of the chain of custody.

20.4.1 The Basic Steps

Investigating officer takes along a Magnifying lens, UV lamp or a polilight to locate semen stains. On reaching the scene performs the steps, mentioned in the text box below.

IO's Basic Steps at the Scene

1. Saves life: arranges medical aid at the earliest for the injured
2. Assesses risk factors in handling the scene. Biological evidence may contain infectious organisms (e.g. hepatitis virus). They are transmitted to any person on contact. He ensures protection for the investigators.
3. Walks through the scene to get an overall picture of the scene and to assess technical and work force needs of processing the scene
4. Plans the crime scene processing properly
5. Demarks/guards/protects the scene and the evidence thereon
6. Documents the scene: videography/photography/sketch/textual narration
7. Documents the location, collection, preservation, packing and sealing of the processing of the evidence, as per legal/departmental rules.
8. Fixes and ensures the identity, authenticity, integrity and unbroken chain of custody, until its possession is legally transferred to other authority (Laboratory, Court)
9. Gets the evidence examined/evaluate d from the concerned expert at the earliest
10. Ensures to:
    - Collect as much sample as possible from various sources separately.
    - Prevent inadvertent contamination of the evidence
    - keep silence while handling the evidence to prevent its contamination.
    - Prevent deterioration of the evidence the sample.
    - Air-dry the stains in an gentle air stream. No hot air blower.
    - Send the evidence on the original format whenever possible
    - Send control sample of the substrata
11. Stores the biological evidentiary clues in a refrigerator after air-drying.
12. Handles/packs the evidence from the culprit/victim/the scene, separately

Semen is delicate evidence. It is processed carefully. The IO takes care to:

1. Handle the evidence to the minimum extent. He sends the article bearing the stain to the laboratory, whenever possible. He ensures that there is no contamination/ destruction of the evidence during transport.
2. Cut out the stained area from a large non-transportable object with a porous surface and pack it in a paper, along with a substrata piece for control, packed separately.
3. Collect the sample by using a slightly moistened cotton swab if he is not able to collect the evidence by the above methods (1,2). Air-dry the swab and then despatch it along with a control substrata sample of an unstained area close to the biological evidence stain, in a separate packet.
4. Collect the stain on the smallest area of the swab or cotton gauze.
5. Air-dry all wet stains at the earliest without exposing them to heat/sunlight
6. Prevent contamination through inter-contact with other evidence, including specimen standards, minimal touching, separate storage of each stain, using clean gloves, tools.
7. Pack the evidence in paper containers. Do not use plastic receptacles!
8. Seal the package. All except the IO, the Analyst and the court, handle the evidence in sealed parcels only.
9. Put the identification data (case Number, PS and date) and his initial on the parcel.
10. Get the signatures of witnesses on the package.
11. Requisition the help of laboratory staff in refractory situations.
12. Use Rape Evidence Kit.

20.4.2 Location of Evidence

The investigating officer locates the semen evidence at various sites:

1. At the Scene

1) He searches the scene for a colourless or a pale yellow stain. If fresh, it gives a characteristic smell. Dry stains do not give the smell. Dry stains are rough to feel. It is stiff and brittle on complete drying.
2) He uses ultraviolet light to locate pale blue fluorescent stains. The fluorescence weakens with the passage of time. Polylight and laser give better results.
3) He gets the help of Forensic Scientist to locate the semen stain in important cases. The acid phosphatase method is the most convenient method to locate and can be used for large areas. It works even for weak stains.

2. With the Victim

The IO takes the victim to a hospital immediately. If the victim is a female, a female medical officer examines her; otherwise, a male doctor examines the victim. The IO requests the doctor to:

1) Describe all the injuries like bite marks and scratches on the body including those on the private parts and photograph them.
2) Collect swabs from all parts, likely to carry semen stains, (oral, vaginal, and/or anal) and to keep/pack/seal the swabs in separate packets after drying them in a gentle stream of air. The doctor must be able to identify the person and the site(s) from where he has collected the swabs. He must also put his signatures and the identification data on the package. Drying is essential. Wet stain deteriorate soon after

3) Collect the clothes worn by the victim at the time of the incident.
4) Collect a blood sample for DNA profiling and other tests.
5) Collect the following entities when collecting reference samples from a decomposed body. These are in addition to the blood sample:
   - a portion of deep muscle tissue,
   - certain organ tissue (e.g., heart or brain; not liver or kidney),
   - 2-4 intact molar teeth (if identification is an issue, ensure that mouth x-rays have been taken), and
   - A sample of compact bone (e.g., femur).

3. With the Culprit

The IO produces the suspect before a doctor and requests the doctor to:

1) Collect the clothes worn by the suspect at the time of committing the crime.
2) Collect semen, vaginal fluid and other stains (faecal matter in case of sodomy) from the suspect.
3) Take penile swabs (including that of glands, shaft, and base of the penis) if the case history and time-frame indicate the need.
4) Take Scrotal Swabs if assailant wore a condom. Focus on area closest in proximity to the penis.
5) Describe the injuries on the suspect, on his private parts including bite marks, scratches on his person. Get them photographed to scale.
6) Collect approximately about 5 ml of a blood sample for DNA profiling. Add anti-coagulant EDTA to the 10.
7) Collect fingernail scrapings using a toothpick, one toothpick per nail. Place all five toothpicks from the right hand into the appropriate container and label them. Repeat for the left hand.

4. In the Vehicle

The vehicle may have been used to kidnap the victim, to take him/her away after the rape or the rape may have been committed in the vehicle itself. Or, it may have been used merely as a transport for getting away from the scene. It is processed in the same way as a usual crime scene (supra). It usually yields useful evidence.

5. At the Residence of the Suspect

The culprit is likely to change clothes at his residence. He may also take steps to remove evidential traces of the crime. The investigating officer, therefore, must locate and collect:

1) The clothes worn by the suspect or culprit at the time of committing the crime
2) The evidence such as dust, weeds, seeds on the clothes or shoes from the scene
3) The fibres, saliva and other stains picked up from the garments of the victim or the scene of the incidence
4) The gag cloth used
5) Discarded cloth/clothe/paper pieces bearing seminal, vaginal, saliva stains, from the dustbin
6) The clothes kept for washing

20.5 COLLECTION

The IO collects all items at the scene having possible evidentiary value pertaining to the suspect/victim and helps to reconstruct the crime. He collects the evidentiary clues systemically ensuring their integrity/authenticity and intact chain of custody during collection/preservation/dispatch.

The kingpin of semen analysis is now DNA profiling. The following guidelines for the collection of semen for DNA analysis are useful. The IO should:

1. Collect as much sample as possible from a single source.
2. Collect at least a significant quantity of material to ensure sufficient DNA for testing purposes
3. The material collected should be as pure as possible. Some contaminants degrade DNA.
4. Air-dry (in a stream of cool air) the sample as fast as possible.
5. Do not expose the semen to heat and strong light
6. Refrigerate liquid semen sample; do not freeze it.
7. Ensure that the collection/packaging/storage of seminal evidence does not compromise the integrity/authenticity of the evidence.
8. Deliver the samples to the forensic laboratory post-haste.
9. Store the evidence in a cool and dry place to reduce deterioration.
10. Remember that blood/bloodstains are used for standard DNA profile used for comparison with the semen DNA profile.

20.5.1 Rape Investigation Kit

Many police organisations have evolved Rape Investigation Kits. They are convenient to handle rape cases. They improve efficiency. They should be part of the IO's arsenal.

Rape Investigation Kit

The kit consists of a box/bag containing small boxes/ microscope slides/plastic bags to collect/ store/preserve evidence (clothing fibers, hairs, body fluids) in an alleged sexual assault:. The essential items are:

1. Instructions pamphlet
2. Bags and sheets for evidence collection
3. Swabs for collecting fluids from the lips, cheeks, thighs, vagina, anus, and buttocks
4. Sterile urine collection containers
5. Sterile sample containers
6. Blood collection devices
7. Comb used to collect hair and fibre from the victim's body
8. Clear glass slides

9. Self-sealing envelopes for preserving the victim's clothes, head hair, pubic hair, and blood samples
10. Nail pick for scraping debris from the nail crevices
11. White sheets to catch physical evidence stripped from the body
12. Documentation forms and paraphernalia
13. Labels

While collecting semen evidence, the investigating officer, in addition to the usual steps and precautions, should:

1. Dry the semen stains completely, before packing. Otherwise, the semen putrefies.
2. Preserve the liquid semen either at low temperature (< 5^0 C) or with preservative (toluene or formalin). Mention the preservative in the noting, if used.
3. Obtain vaginal swabs and collect stains from the person and clothes of the female victim with the help of a female doctor.

In an interesting case, a doctor raped one of his patients, after injecting a strong sedative, to make her immobile. She complained to the police. DNA profiling of the blood from the doctor and the semen from her undergarments did not tally. The police let off the doctor. The case was reopened on the insistence of the victim. But DNA profiling again came to the rescue of the doctor.

In the meantime, another patient of the doctor complained of rape. The wife of the doctor became suspicious. She checked his medicine chest and was surprised to find a number of ampoules of the sedative injected into the two victims! She went to the police. Fresh DNA tests were carried out. But this time with cells taken from hair, saliva and blood. Semen DNA profiles corresponded, not only of the second victim but also with that of the first victim. The doctor confessed and he was convicted.

He hoodwinked the earlier DNA profiling tests by placing surgically a capsule containing blood obtained from a patient underneath his skin in the arm. He, unobtrusively, guided the needle of the syringe to the capsule when the technician was taking the blood sample for DNA profiling. ***(CH)***$_1$

20.6 POSSIBILITIES

The semen analyst can answer the following questions:

20.6.1 Is the questioned stain a semen stain?

Semen identification was formerly based upon the identification of the spermatozoon in the stain. Even now when an intact spermatozoon or its head is found, the nature of the stains is established. However, aspermic semen stains or the stains where the sperm are destroyed are identified through tests. There are two types of tests: presumptive tests and confirmatory tests.

20.6.1.1 Presumptive Tests

(a) **Smell;** if the semen stain is fresh it gives characteristic semen smell.

(b) **Dried stain**; they have Characteristic rough and brittle nature.

(c) **Fluorescence;** semen stains give characteristic fluorescence under UV rays.

(d) **Florence and Barberio's tests;** they are **a c**hemical test for choline and give characteristic crystals.

(e) **Acid phosphatase test:** This test is fairly characteristic and sensitive for the enzyme. The enzyme is found in other body fluids also. However, it is in significantly larger quantity in semen. The test is also used to locate semen on garments, bed sheets.

20.6.1.2 Confirmatory tests

(a) **Precipitin test with antihuman semen serum;** it gives unequivocal confirmation of the presence of semen.

In an interesting case, a woman alleged that Mr. X molested her in an attempt to rape her. She pointed semen like stain on her clothes. The stain, on examination in the laboratory was found to be white of an egg! **(CH)**$_1$

(b) **Conventional forensic serology methods** used in blood discrimination are also used in identifying semen in sexual assault cases. However, their use is diminishing at break-neck speed with the passage of time. Traditional serology utilised the following systems for semen discrimination:

- ABO (H) system
- Lewis antigens Enzyme typing system
- Phosphoglucomutase (PGM) system
- Peptidase A system
- p30 The glycoprotein: a prostate specific antigen

However, they are now becoming almost historical entities

DNA technology; it has revolutionized semen discrimination because of its highly polymorphic nature and extreme stability. It permits individualization with extraordinarily high sensitivity and specificity. It was not time/cost effective previously but not so now.

DNA profiling; in sexual assault investigations is becoming indispensable due to its ability to accurately individualize semen even in mixed stains from multiple donors (semen contributed by different individuals). Polymerase chain reaction and Restriction Fragment Length Polymorphism have improved the handling of the evidence. It is becoming the kingpin evidence in the investigation and prosecution of sexual assault cases.

20.6.2 Are the semen stains from the suspect?

Blood group factors are found in the semen of most of the persons. They, therefore permit the identification of the suspect on the pattern of blood evidence—high probability and no specific identity. Now DNA profiling of semen/semen stain provides a specific identity of the culprit. Not only the individual can be identified specifically, but in gang rape cases all those who raped the victim can be identified even from the mixture of the semen picked up on the vaginal swab or from the garments of the victim.

In a case, two girls were raped and one was murdered. A boy of 17 years was suspected to be the killer. Under interrogative pressure, he confessed to the crime. However, his DNA profile of the semen from the victim did not match with that of the culprit. The boy was let off. Mass screening of the youths of the town was carried out. However, to no avail. However, after sometime another youth became the prime suspect. His DNA profile matched with the DNA profile of the evidential semen. The youth was convicted for the murder. **(CH)**

20.6.3 How old are the stains?

Absolute age of a semen stain cannot be given because time alone does not affect the changes. Environmental conditions also affect. Semen undergoes the following changes.

1) Semen is gel-like when fresh.
2) It liquefies to a transparent liquid, on standing.
3) It is an opaque white substance on drying.
4) It gives characteristic odour until it is completely dry.
5) It loses its characteristics smell on drying.
6) The stain turns light yellow with age.
7) Whole sperms are seen in the stain up to about three weeks under ideal conditions. They disintegrate thereafter.

20.6.4 How long can Spermatozoa Survive?

Sperms remain mobile only for a few hours in the vagina. They may be alive in the vagina for about 24 to 72 hours. However, in frozen semen, the mobility and potency of the sperms remain over long periods.

In the vagina, sperm may be found up to about a week of coitus. The number of sperms, however, goes on decreasing. It is rare that sperm is detected after 3 days. Putrefaction of the body destroys the sperms. Climatic conditions and temperature are important factors to save/destroy sperms in cadavers.

20.6.5 Can gang rape culprits be individually identified from mixed semen vaginal swabs or stains?

DNA profiling can identify all the gang rapists. Semen from an individual can be identified from a mixture of semen; as in gang rapes.

> *In the Nirbhaya rape case, 6 rapists raped the victim in a bus in Delhi on 16th December 2012. DNA analysis and comparison of DNA profiles of the semen in the vaginal swab and DNA profiles developed from the blood of the accused matched. All the six rapists were identified, convicted and sentenced (4 to death, 1 committed suicide and the juvenile to 3 years reformatory confinement).* (CH)[3]

20.6.6 Can the semen of a Non-secretor be linked to him?

DNA profiling permits linkage of the semen of a non-secretor to the source person.

20.6.7 Can the aspermic semen be linked to the source person?

There is no difficulty in linking the aspermic semen with the source person.

20.7 SALIVA

Many body fluids, other than blood, semen, urine, which occasionally acquire importance in criminal investigations include saliva, urine, faeces, sweat, nasal secretion, tears and human milk. They link the criminal, the victim, the scene *inter se*. Saliva among them is the most important.

20.7.1 Importance

Saliva is an important evidentiary clue in a variety of cases including that of offences against the person, drug abuse, sex determination, identification/individualisation of the biter in bite marks via saliva, which is deposited in prints, bite marks, cigarette butts, on stamps and other objects. Analysis of saliva for serological testing and cellular content has proved to be of wide use in crime detection, drug and alcohol abuse, hormone identification, cases of poisoning and animal bites.

Saliva is assuming great importance as an evidentiary clue in forensic situations:

1) It is being used increasingly as a standard genetic material for DNA profiling because of its keeping quality, Ease of collection and importantly because of its more or less non-invasive collection.
2) Saliva also contains *mitochondrial* DNA (*mt*. DNA) in greater abundance. If the nuclear DNA analysis is not forthcoming mt DNA helps.
3) It does not need a doctor for collection. Even the IO can collect the sample at pinch.
4) It helps to identify the drug an addict has taken. Saliva offers one of the least non-intrusive methods for the detection of the abuse of prohibited narcotic drugs (amphetamines, barbiturates, benzodiazepines, phencyclidine, cocaine, opioids). Analytical techniques have crossed all physical barriers. The technology can analyse the smallest amount of most of the abused drugs.
5) Many drugs (such as phenobarbital, amphetamine and morphine) are detected in saliva and saliva stains by radioimmunoassay (RIA).
6) It helps in sex determination. The presence and detection of sex chromatin (Barr bodies in females and F bodies in males) indicate the sex of the biter. The ration of the sex hormones is also helpful for the purpose
7) It identifies whether the bite mark source is human or non-human. Salivary immunoglobulin in the bite of an animal/beast has been utilised to identify the species of the beast/animal through immunoassay techniques. The biter can be identified even after a long interval through monoclonal antibodies: ELISA with monoclonal antibodies helps to detect salivary immunoglobulin. Cross-over electrophoresis and double gel infusion are also used to identify non-human bites.
8) Saliva DNA profile is being used increasingly in bite marks. Saliva is deposited in/around the marks in many homicides, assault and other criminal cases. Its collection/analysis can identify the biter positively. The mode is superior to odontological identification as the teeth marks are not registered.

   Both[1] culprits/victims often bite one another for different reasons. It is found in cases of many homicides, sexual assault/molestations and other criminal cases. The biting process deposits saliva in the bite mark. It contains DNA molecules, which can identify the biter irrefutably.[2]

   External factors, like contaminants, heat, moisture, sunlight can degrade the sample. The Analysis, therefore, should be done at the earliest.

1. The flexibility and elasticity of the skin/flesh do not permit proper registration of the Topography of teeth marks. They may be identified from the bit structure in some cases not in all cases.
2. It cannot distinguish between identical twins.

20.7.2 Nature

Saliva is a fluid secreted by the salivary glands in the mouths of human beings and animals. In human beings quantity-wise, it is mostly water (> 95 %). It acts as a lubricant to help swallow food, provides digestive enzymes to break the food molecules to make them digestible and maintains proper pH and oral hygiene.

Saliva contains numerous prominent constituents including:

1) Blood cells, Epithelial cells which provide DNA
2) Enzymes (amylase, lipase). They help to digest the food. Amylase is used to detect the presence of saliva in a stain. Ptyalin when added to starch, hydrolyses it. Saliva extract, therefore, when added to starch, inhibits its colour reaction with iodine
3) Anti- microbial materials (for example, lysozymes)
4) Mucus
5) Electrolytes.

Saliva is deposited during biting, sucking, licking, spitting.

Saliva of secretors contains blood group substances and can be grouped. The saliva on cigarette stubs is often grouped in criminal investigation. DNA profiling of the saliva stains has enhanced the evidential value of the saliva stains and it is *at par* with blood and semen.

Food material mixed in saliva may interfere with blood grouping.

Saliva does not give specific precipitin test.

20.7.3 Location

Saliva stains are found, almost invariably, on bite marks, the surface licked or the entity sucked, on the utensils used for drinking water or any other beverage. They may also be found on spoons/forks used in eating.

Saliva stains are found at the scene, on a handkerchief, on discarded cigarette stubs, spittal, on cups, tumblers, bottles (used for drinking) on postage stamps or envelopes or even on toothpicks. If a person is gagged, the gag (a piece of cloth/tap used to silence the victim) will carry saliva stains.

Many people in India, especially the criminals, often are addicted to betel chewing. They spit the betel waste. It contains saliva.

20.7.4 Detection

Detection of saliva evidentiary clues is rather a difficult task because of it almost invisibility and the uncongenial substrata (human body many a time) on which they are found. The age and amount of saliva play an important part in the location of saliva stains. The following techniques are used to detect dry stains:

- Fluorescent spectroscopy: the suspected stain area is sprayed with tryptophan in α-salivary amylase. It gives a characteristic fluorescence. The technique is sensitive to detect dried saliva stains on the skin.
- UV rays: They give fluorescence.
- Lasers: argon ion laser give fluorescence.
- Alkaline phosphatase and salts like nitrate and thiocyanate are also used for the detection of dried saliva stains.

20.7.5 Collection

Traces of saliva from the stain are collected through swabs. A single wet cotton swab or wet filter paper (a part only) is kept upon the skin area suspected to bear the saliva stain for some time. It picks up the saliva material.

Some workers use a second dry swab after the wet one and combine the extracts from the two for evaluation.

20.7.6 Evaluation

1. **DNA profile** of each individual is unique except for identical siblings. It does not change over the lifetime of an individual. The polymorphic repair of STR in small fragments makes it possible to evaluate DNA even from degradation products.
2. ***mito*Chondrial DNA (*mt*DNA)** profile.; *mt*DNA is present in hair shafts and saliva samples. In the absence of nuclear DNA, *mt*DNA is used for maternal DNA profile
3. **Drug Analysis;** addict/addiction identification is usually done by drug analysis from the urine of the suspect. However, saliva is a better biological clue material because urine can be manipulated (substituted) and sometimes a question of privacy also comes up.

   Developments in analytical techniques have made it possible to analyze a large number of drugs (amphetamines, barbiturates, benzodiazepines, phencyclidine, cocaine and opioids are being analysed routinely) from saliva. The major advantage of saliva analysis is that the mode is easy, rapid and non-invasive.

   Radioimmunoassay is used to detect recent intake of marijuana from saliva.

The saliva, as an evidentiary clue, is assuming greater and greater importance due to continuously increasing sex crimes (and other offences against person), safe handling, easy processing and definite identification of the culprit (thanks to DNA profiling). The laboratories must gird up their loins and induct automation for saliva analysis.

20.8 URINE

20.8.1 Importance

Urine analysis is an important toxicological analysis in Forensics. It is routinely used for the detection of drugs like marijuana, cocaine, heroin, and amphetamines as well as their metabolites. The main purposes for which urine is analysed are:

1. Identification of drug addict
2. Identification of the drug abused
3. Determination of the dose of the drug taken
4. The nature of the poison and the dose administered in poisoning cases
5. Verification of the incident whether the drug/poison administered was a case of murdered/accident or suicide.
6. Determination if an overdose of prescription medicine has been administered
7. Monitoring drug dependency or to determine the presence of drugs in the body for medical and legal purposes.
8. Determination of drunkenness[3]

3. Details in the chapter on Alcohol Forensics.

In many organisations abroad, periodic drug screening is an important service condition for employment.

20.8.2 Nature

Urine is a complex mixture of both organic and inorganic compound in a matrix of biological materials. The materials being searched are in minute quantities; they need highly sensitive and specific techniques. In some cases, immediate results are needed. Their analysis, therefore, is a challenging task for the forensic science laboratories.

20.8.3 Evaluation

Urine is identified from the following characteristics:

1. Fresh stains give characteristic odour.
2. Stains fluoresce when exposed to UV rays. Fluorescence is weak and become weaker with time.
3. Urine contains large amount of urea. It gives characteristic smell on heating.
4. Urine contains creatinine. It gives red colour with picric acid solution in toluene.
5. Para-dimethylaminocinnamaldehyde (DMAC) is popular presumptive test. It is a simple, rapid and safe test. A concentration of 0.05% w/v is appropriate for the test. The test, however, is not specific for urine. Many other body fluids also give the test.
6. Urine usually contains body cells. DNA profiling individualises the stain
7. The tendency is to use instrumental techniques.[4] Mass spectrometry are separated from the molecules, ionised (electron ionization) them and then identify them. More recently, Direct Analysis in Real Time (DART) is used for ionization

The most important use of urine in Forensics is to identify/quantify the drugs of abuse. Mass Spectrometry is perhaps the best mode. It is the main discriminatory technique. It measures the precise molecular mass of ions as determined by their mass to charge ratio (m/z). SEM coupled with EDX is used to identify its elemental composition profile.

20.9 SWEAT

Sweat stains are involved in those cases where the culprits discard/leave some garments at the crime scene. Or, where the culprit/victim have perspired profusely and sweat fell at the spot or they wiped it and left the wipe at the scene.

Sweat is not a common evidentiary clue in forensics but it can provide definite evidence due to the presence of Body cells. They are extracted in some cases from sweat absorbed in hats/waist bands.

The composition of sweat is similar to urine. However, if the two substances are heated, the odour is characteristically different.

Relatively recently a sweat-specific protein was discovered. An antibody[5] (G-81) for the protein has been developed. It specifically identifies sweat antigen through the formation of a coloured complex, which shows different absorbance than other body fluids.

4. "An overview of forensic drug testing methods and their suitability for harm reduction point-of-care services," Harm Reduction J (July 31, 2017), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5537996/(last accessed in November 2019).
5. It is not specific to other body fluids.

20.10 FAECES

Faeces are involved in cases of sodomy and bestiality. The stains are found on the active agent, his undergarments, on the flies of the trousers and on flaps of the shirt.

Faeces are identified microscopically. Bacterial studies of the faeces may also lead towards individualization but the same has not been exploited routinely, at present.

It is possible to identify the human or animal origin of the faeces.

20.11 CASE LAW

20.11.1 Nirbhaya Gang Rape-murder[6]

Author's Summary

It is a landmark judgment where the judges have utilised Forensics extensively for the dissemination of justice.

The facts of the case are that the victim Nirbhaya, along with her friend (PW- 1) boarded a bus going to Dwarka/Palam. They noticed that six persons were already inside the bus, four in the cabin of the driver and two behind the driver's cabin. The accused persons did not allow anyone else to board. The bus moved and the inside lights of the bus were put off. A few minutes later, three persons (identified as accused Ram Singh, Akshay and a juvenile) started to abuse. Pw-1 objected. It led to altercation. The two other joined the melee. PW-1 was beaten badly and became immobile. Nirbhaya was not only raped by all the six but treated her so brutally that she died a few days later, in spite of the best medical help.

The police did an excellent job of locating and using all the scientific evidence and presented an airtight case. The appreciation by the SC has been highlighted in italics.

All the courts (trial, high court and the Supreme Court) appreciated the evidence. And found it **'rarest rare of the cases'** and sentenced them to death, excluding the juvenile.

Relevant Extracts (Verbatim)

The prosecution case, as projected, is that on 16.12.2012, the deceased, 'Nirbhaya' (not her real name), had gone with her friend, the informant, PW- 1, to the PVR situated in Select City Walk Mall, Saket to watch a movie. After the show was over, about 8:30 p.m., they took an auto and reached Munirka bus stand wherefrom they boarded a white coloured chartered bus [DL- 1P-C-0149, Ext.P1] which was bound to Dwarka/Palam Road, as a boy in the bus was calling for commuters for the said destination. As per the version of the informant, PW-1, the friend of the prosecutrix, the bus had yellow and green lines/stripes and the word "Yadav" was written on it.

After both of them had entered the bus, they noticed that six persons were already inside the bus, four in the cabin of the driver and two behind the driver's cabin. The deceased and the informant sat on the left side in the row of two-seaters and paid the fare of twenty rupees as demanded. Before they could get the feeling of a safe journey (though not a time-consuming journey), a feeling of lonely suffocation and a sense of danger barged in, for the accused persons did not allow anyone else to board and the bus moved and the lights inside the bus were put off. With the lights being put off, the darkness and the fear of the unexpected darkness ruled.

6. *Mukesh v State for NCT Delhi,* Criminal Appeal Nos. 607-608 of 2017, SC, Decided on 5 May 2017. Bench: Dipak Misra, R Banumathi, Ashok Bhushan.
The Supreme Court has discussed the evidence relating to DNA, bite marks and fingerprint lucidly, with numerous case citations.

A few minutes later, three persons (who have been identified as accused Ram Singh, Akshay and a young boy, who has been treated as a juvenile in conflict with the law) came out of the driver's cabin and started to abuse PW- 1. The young companion of the deceased raised opposition to the abuse that led to an altercation which invited the other two who were sitting outside the driver's cabin to join.

The spirit to oppose and the duty to save the prosecutrix had to die down and perilously succumb to the assault by the accused persons with the iron rods that caused injuries to his head, both the legs and other parts of the body and the consequence was that he fell on the floor of the bus to hear the painful cries of the lady who, he knew, was being treated as an object, an article for experimentation and prey to the pervert proclivity of the six but could do nothing except to hear unbearable cries made in agony and pain. His spirit was dead, and bound to.

5. As the prosecution story further unfurls, the two accused persons, namely, Pawan and Vinay, pinned the young man down and robbed the victims of their mobiles besides robbing the informant of his purse carrying a Citi Bank credit card, ICICI Bank Debit Card, his identity card issued by his employer-company, metro card, a sum of rupees one thousand, his Titan Watch, a golden ring studded with jewels and a silver ring studded with pearl, black colour Hush Puppies shoes, black colour Numero Uno jeans, a grey colour pullover and a brown colour blazer. As per the version of the prosecution, PW-1 was carrying two mobiles and the prosecutrix was carrying only one, and the accused snatched away all the three mobiles.

6. The overpowering was not meant to satisfy the avarice. As the accusations proceed, after the informant was overpowered, as it could only have a singular result, the accused persons, namely, Ram Singh, Akshay and the Juvenile in Conflict with Law (JCL) took the prosecutrix to the rear side of the bus and she was raped by them, one after the other.

7. After committing rape, the accused Ram Singh (since deceased), accused Akshay and the JCL came towards the informant, PW-1, and nailed him down; then the accused Vinay and accused Pawan went to the rear side of the bus and committed rape on the prosecutrix, one by one. PW-1 noticed that earlier the bus was moving at fast speed but after sometime, he felt that the speed of the bus was reduced and he saw that the accused Mukesh, who was driving the bus, came near him and hit him with the rod and he also went to the rear side of the bus and raped the prosecutrix.

The prosecutrix was brutally gang raped by the accused one after the other and she was also subjected to unnatural sex. Her private parts and her internal organs were seriously injured by inserting an iron rod and hand in the rectal and vaginal region. As per PW-1, he had heard the cries of the prosecutrix like "chod do, bachao". PW-1 could hear the prosecutrix shouting in a loud oscillating voice. The prosecutrix was carrying a grey colour purse having an Axis Bank ATM card and other belongings.

The accused persons robbed her of her belongings and stripped her. They also took away the clothes of the informant while beating him with iron rods. The accused were exhorting that both the victims be not left alive. The accused then tried to throw both the informant and the prosecutrix out of the moving bus from its rear door but could not open it and so, they brought them to the front door and threw them out of the moving bus at National Highway No. 8, Hotel Delhi 37, Mahipalpur flyover by the side of the road.

8. As indicated earlier, the prosecutrix and PW-1 were noticed by PW-72, Raj Kumar, who heard the voice of 'bachao, bachao' from the left side of the road near a milestone opposite to Hotel Delhi 37. PW-72 saw PW-1 and the prosecutrix sitting naked having blood all around. Immediately thereafter, PW-72, Raj Kumar, informed PW-70, Ram Pal, who was in the Control Room, requesting him to call PCR. PW-70, Ram Pal, of EGIS Infra Management India (P) Limited, dialled 100 No. and even asked his other patrolling staff to reach the spot.

9. About 10:24 p.m., PW-73, H.C. Ram Chander, who was in charge of PCR van Zebra 54, received information about the incident and the lying of victims in a naked condition near the foot of Mahipalpur fly over towards Dhaula Kuan opposite GMR Gate. PW-73 reached the spot and found the victims. He got the crowd dispersed and brought a bottle of water and a bed sheet from the nearby hotel and tore the same into two parts and gave it to both the victims to cover themselves.

20.11.2 Collection of samples and identity of accused persons

32. The blood sample of the informant was collected by Dr. Kamran Faisal, PW-15, Safdarjung Hospital, on 25.12.2012 and was handed over to SI Pratibha Sharma, PW-80, vide seizure memo Ex.PW-15/A by Constable Suresh Kumar, PW-42. Similarly, as mentioned earlier, PW-49, Dr. Rashmi Ahuja, had collected certain samples from the person of the prosecutrix which are reflected in Ex.PW-49/A from point B to B. All the samples were collected by Inspector Raj Kumari, PW-59, vide seizure memo Ex.PW-59/A and were handed over to PW-80, SI Pratibha Sharma, at Safdarjung Hospital in the morning of 17.12.2012.

Also the samples of gangrenous bowels of the prosecutrix were taken on 24.12.2012 and were handed over to SI Gajender Singh, PW-55, who seized the same vide seizure memo Ex.PW-11/A. All the samples were deposited with the MHC(M) and were not tampered with in any manner. A specimen of scalp hair of the prosecutrix was also taken on 24.12.2012 by Dr. Ranju Gandhi, PW-29, and was handed over to PW- 80, SI Pratibha Sharma, vide seizure memo Ex.PW-29/A.

33. The accused were also subjected to medical examination and samples were taken from their person which were sent for DNA analysis.

34. ***DNA analysis*** was done at the behest of PW-45, Dr. B.K. Mohapatra, Sr. Scientific Officer, Biology, CFSL, CBI, and Biological Examination and DNA profiling reports were prepared which are exhibited as Ex. PW-45/A-C. The report, after analysing the DNA profiles generated from the known samples of the prosecutrix, the informant, and each of the accused, concluded that: "An analysis of the above shows that the samples were authentic and established the identities of the persons mentioned above beyond reasonable doubt."

35. On 17.12.2012 and 18.12.2012, a team of experts from the CFSL went to Thyagraj Stadium and ***lifted chance prints from the bus*** in question, Ex.P-1. On 28.12.2012, PW-78, Inspector Anil Sharma of P.S. Vasant Vihar, the then S.H.O. of Police Station Vasant Vihar, requested the Director, CFSL, for taking digital palm prints and foot prints of all the accused persons vide his letter Ex.PW-46/C. Pursuant to the said request made by PW-78, Inspector Anil Sharma, the CFSL, on 31.12.2012, took the finger/palm prints and foot prints of the accused persons at Tihar Jail. After comparing the chance prints lifted from the bus with the finger prints/palm prints and foot prints of all the accused persons, PW-46, Shri A.D. Shah, Senior Scientific Officer (Finger Prints), CFSL, CBI submitted his report Ex.PW- 46/D. In the report, the chance prints of accused Vinay Sharma were found to have matched with those on the bus in question.

> 36. ***Bite mark analysis*** *was also undertaken by the investigative team to establish the identity and involvement of the accused persons. PW-66, Asghar Hussain, on the instructions of the I.O., S.I. Pratibha Sharma, had taken 10 photographs of different parts of the body of the prosecutrix at SJ Hospital on 20.12.2012 between 4:30 p.m. and 5:00 p.m. which were marked as Ex.PW-66/B (Colly.) [10 photographs of 5" x 7" each] and Ex.PW-66/C (Colly.) [10 photographs of 8" x 12" each]. PW-66 also proved in Court the certificate provided by him in terms of Section 65-B of the Evidence Act in respect of the photographs, Ex. PW-66/A.*
>
> *Thereafter, PW-18, SI Vishal Choudhary, collected the photographs and the dental models from Safdarjung Hospital on 01.01.2013 and duly deposited the same in the malkhana after he, PW-18, had handed them over to the S.H.O. Anil Sharma, PW-78. The same were later entrusted to S.I. Vishal Choudhary, PW-18 on 02.01.2013, which is proved vide RC*

No.183/21/12 and exhibited as Ex.PW-77/V. PW-71, Dr. Ashith B. Acharya, submitted the final report in this regard which is exhibited as Ex. PW-71/C. In the said report, he has concluded that at least three bite marks were caused by accused Ram Singh whereas one bite mark has been identified to have been most likely caused by accused Akshay.

Thereafter, on 03.01.2013, the report of the CFSL was received. In fact, the trial court had assured itself of the correct identification of the bus by playing the said CCTV footage shown in the pen drive, Ex.PW-67/1, and the CD, Ex.PW-67/2, during the cross-examination of PW-67, Pramod Jha.

98. Learned counsel Mr. Singh has asserted that bus, Ex. P-1, has been falsely implicated in the present case as is evidenced from the recovery of the CCTV footage. In an attempt to discredit the CCTV footage, he pointed out that only the CCTV recording alleged to be of this bus was recorded and not of all other white buses that had 'Yadav' written on them. The learned counsel for the defence subsequently maintained that the CCTV footage cannot be relied upon as the same has been tampered with by the investigating officers.

99. PW-76, Gautam Roy, HOD, Computer Cell, Forensic Division, has testified that on 02.01.2013, he had received two sealed parcels sealed with the seal of PS and the seals tallied with the specimen seals provided. He marked the blue coloured pen drive found in parcel No.1 as Ex.1 and the Moser Baer CD found in the second parcel as Ex.2. He further testified that both the exhibits were played by him on the computer and the bus was seen twice, at 9:34 p.m. and 9:54 p.m.

He had photographed all these three by freezing the pen drive and the CD and these photographs were compared by him with the photographs taken by the photographer, PW-79, P.K. Gottam, which he had summoned. The witness testified that he had prepared the three comparison charts in this regard as Ex.PW-76/B, PW-76/C and PW-76/D, and his detailed report as Ex.PW-76/E.

The footage taken in a CD and pen drive was sealed in PW-67's presence and as the recording was automatic data being fed on regular basis into the hard disk, the question of tampering with the same could not arise. PW-79, P.K. Gottam, from CFSL, CBI, has stated in his examination that he took photographs of the bus bearing No.DL- 1P-C-0149 parked at Thyagraj Stadium, INA, New Delhi from different angles on 17.12.2012 and 18.12.2012 and handed over the same to PW-76. The said photographs were marked as B1 in Ex.PW-76/B; as C1 and C2 in Ex.PW-76/C; and as D1 in Ex.PW-76/D. He has deposed as to the genuineness of the photographs by deposing that the software used for developing the photographs was tamper proof.

100. Once it is proved before the court through the testimony of the experts that the photographs and the CCTV footage are not tampered with, there is no reason or justification to perceive the same with the lens of doubt. The opinion of the CFSL expert contained in the CFSL report marked as Ex.PW-76/E authenticates that there was no tampering or editing in both the exhibits, Ex.P-67/1 and Ex.P- 67/2, and that a bus having identical patterns as the one parked at Thyagraj Stadium is seen in the CCTV footage, which includes the word "Yadav" written on one side, "back side dent (left)" and absence of wheel cover on the front left side. The contents of the report is also admitted to be true by its author, PW-76, Gautam Roy. Quite apart from that, it is perceptible that the High Court, in order to satisfy itself, had got the CCTV footage played during the hearing and found the same to be creditworthy and acceptable. 157.

207. *Having dealt with the aspect pertaining to insertion of the rod, it is apposite to advert to the medical evidence and post mortem report. We have, while dealing with other aspects, referred to certain aspects including* ***DNA analysis*** *of medical evidence but the same requires to be critically dealt with as the prosecution has placed heavy reliance upon it.*

208. DNA is the abbreviation of Deoxyribose Nucleic Acid. It is the basic genetic material in all human body cells. It is not contained in red blood corpuscles. It is, however, present in white corpuscles. It carries the genetic code. DNA structure determines human character, behaviour and body characteristics. DNA profiles are encrypted sets of numbers that reflect a person's DNA makeup which, in forensics, is used to identify human beings. DNA is a complex molecule. It has a double helix structure which can be compared with a twisted rope 'ladder'.

209. The nature and characteristics of DNA had been succinctly explained by Lord Justice Phillips in Regina v Alan James Doheny & Gary Adams[83]. In the above case, the accused were convicted relying on results obtained by comparing DNA profiles obtained from a stain left at the scene of the crime with DNA profiles obtained from a sample of blood provided by the appellant.

In the above context, with regard to DNA, the following was stated by Lord Justice Phillips: "Deoxyribonucleic acid, or DNA, consists of long ribbon-like molecules, the chromosomes, 46 of which lie tightly coiled in nearly every cell of the body. These chromosomes - 23 provided from the mother and 23 from the father at conception, form the genetic blueprint of the body. Different sections of DNA have different identifiable and discrete characteristics.

When a criminal leaves a stain of blood or semen at the scene of the crime it may prove possible to extract from that crime stain sufficient sections of DNA to enable a comparison to be made with the same sections extracted from a sample of blood provided by the suspect. This process is complex and we could not hope to describe it more clearly or succinctly than did Lord Taylor C.J. in the case of Deen (transcript:December 21, 1993), so we shall gratefully adopt his description. "The process of DNA profiling starts with DNA being extracted from the crime stain and also from a sample taken from the suspect. In each case the DNA is cut into smaller lengths by specific enzymes. The fragments produced are sorted according to size by process of electrophoresis.

This involves placing the fragments in a gel and drawing them electromagnetically along a track through the gel. The fragments with smaller molecular weight travel further than the heavier ones. The pattern thus created is transferred from the gel onto a membrane. Radioactive DNA probes, taken from elsewhere, which bind with the sequences of most interest in the sample DNA are then applied. After the excess of the DNA probe is washed off, an X-ray film is placed over the membrane to record the band pattern. This produces an auto radiograph which can be photographed. When the crime stain DNA and the sample DNA from the suspect have been run in separate tracks through the gel, the resultant auto-radiographs can be compared. The two DNA profiles can then be said either to match or not.""

210. In the United States, in an early case Frye v United States[84], it was laid down that scientific evidence is admissible only if the principle on which it is based is substantially established to have general acceptance in the field to which it belonged. The US Supreme Court reversed the above formulation in Daubert v Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 [85] stating thus: "11. Although the Frye decision itself focused exclusively on "novel" scientific techniques, we do not read the requirements of Rule 702 to apply specially or exclusively to unconventional evidence. of course, well- established propositions are less likely to be challenged than those that are novel, and they are more handily defended. Indeed, theories that are so firmly established as to have attained the status of scientific law, such as the laws of thermodynamics, properly are subject to judicial notice under Fed.Rule Evid.201.

13. This is not to say that judicial interpretation, as opposed to adjudicative fact finding, does not share basic characteristics of the scientific endeavour: "The work of a judge is in one sense enduring and in another ephemeral... In the endless process of testing and retesting, there is a constant rejection of the dross and a constant retention of whatever is pure and sound and fine." B.Cardozo, The nature of the Judicial Process 178, 179 (1921)."

211. The principle was summarized by Blackmun, J., as follows: "To summarize: "general acceptance" is not a necessary precondition to the admissibility of scientific evidence under the Federal Rules of Evidence, but the Rules of Evidence-especially Rule 702-do assign to the trial judge the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand. Pertinent evidence based on scientifically valid principles will satisfy those demands. The inquiries of the District Court and the Court of Appeals focused almost exclusively on "general acceptance," as gauged by publication and the decisions of other courts. Accordingly, the judgment of the Court of Appeals is vacated and the case is remanded for further proceedings consistent with this opinion."

212. After the above judgment, the DNA Test has been frequently applied in the United States of America. In District Attorney's Office for the Third Judicial District et al. v William G. Osborne[86], Chief Justice Roberts of the Supreme Court of United States, while referring to the DNA Test, stated as follows: "DNA testing has an unparalleled ability both to exonerate the wrongly convicted and to identify the guilty. It has the potential to significantly improve both the criminal justice system and police investigative practices.

The Federal Government and the States have recognized this, and have developed special approaches to ensure that this evidentiary tool can be effectively incorporated into established criminal procedure-usually but not always through legislation. ... ... Modern DNA testing

can provide powerful new evidence unlike anything known before. Since its first use in criminal investigations in the mid- 1980s, there have been several major advances in DNA technology, culminating in STR technology. It is now often possible to determine whether a biological tissue matches a suspect with near certainty. While of course many criminal trials proceed without any forensic and scientific testing at all, there is no technology comparable to DNA testing for matching tissues when such evidence is at issue."

213. DNA technology as a part of Forensic Science and scientific discipline not only provides guidance to the investigation but also supplies the Court accrued information about the tending features of identification of criminals. The recent advancement in modern biological research has regularized Forensic Science resulting in radical help in the administration of justice. In our country also like several other developed and developing countries, DNA evidence is being increasingly relied upon by courts. After the amendment in the Criminal Procedure Code by the insertion of Section 53A by Act 25 of 2005, DNA profiling has now become a part of the statutory scheme. Section 53A relates to the examination of a person accused of rape by a medical practitioner.

214. Similarly, under Section 164A inserted by Act 25 of 2005, for medical examination of the victim of rape, the description of material taken from the person of the woman for DNA profiling is a must. Section 53A sub-section (2) as well as Section 164(A) sub-section (2) are to the following effect:

"Section 53A. Examination of person accused of rape by Medical Practitioner.-

(1) ... ...

(2) The registered medical practitioner conducting such examination shall, without delay, examine such person and prepare a report of his examination giving the following particulars, namely:- the name and address of the accused and of the person by whom he was brought, the age of the accused, marks of injury, if any, on the person of the accused, the description of material taken from the person of the accused for DNA profiling, and other material particulars in reasonable detail. Section 164A. Medical Examination of the victim of rape.-

(1) ... ...

(2) The registered medical practitioner, to whom such woman is sent, shall, without delay, examine her person and prepare a report of his examination giving the following particulars, namely:- the name and address of the woman and of the person by whom she was brought; the age of the woman; the description of material taken from the person of the woman for DNA profiling; marks of injury, if any, on the person of the woman; general mental condition of the woman; and other material particulars in reasonable detail."

215. This Court had the occasion to consider various aspects of DNA profiling and DNA reports. K.T. Thomas, J. in Kamti Devi (Smt.) and another v Poshi Ram[87], observed:

10. We may remember that Section 112 of the Evidence Act was enacted at a time when the modern scientific advancements with deoxyribonucleic acid (DNA) as well as ribonucleic acid (RNA) tests were not even in contemplation of the legislature. The result of a genuine DNA test is said to be scientifically accurate. ...

216. In Pantangi Balarama Venkata Ganesh v State of Andhra Pradesh[88], a two-Judge Bench had explained as to what is DNA in the following manner:

"41. Submission of Mr Sachar that the report of DNA should not be relied upon, cannot be accepted. What is DNA? It means: "Deoxyribonucleic acid, which is found in the chromosomes of the cells of living beings is the blueprint of an individual. DNA decides the characteristics of the person such as the colour of the skin, type of hair, nails and so on. Using this genetic fingerprinting, identification of an individual is done like in the traditional method of identifying fingerprints of offenders.

The identification is hundred per cent precise, experts opine." There cannot be any doubt whatsoever that there is a need for quality control. Precautions are required to be taken to ensure preparation of high molecular weight DNA, complete digestion of the samples with appropriate enzymes, and perfect transfer and hybridization of the blot to obtain distinct bands with appropriate control. (See article of Lalji Singh, Centre for Cellular and Molecular Biology, Hyderabad in DNA profiling and its applications.) But in this case there is nothing to show that such precautions were not taken.

42. Indisputably, the evidence of the experts is admissible in evidence in terms of Section 45 of the Evidence Act, 1872. In cross-examination, PW 46 had stated as under: "If the DNA fingerprint of a person matches with that of a sample, it means that the sample has come from that person only. The probability of two persons except identical twins having the same DNA fingerprint is around 1 in 30 billion world population.""

217. In Santosh Kumar Singh v State Through CBI[89], which was a case of a young girl who was raped and murdered, the DNA reports were relied upon by the High Court which were approved by this Court and it was held thus:

71. We feel that the trial court was not justified in rejecting the DNA report, as nothing adverse could be pointed out against the two experts who had submitted it. We must, therefore, accept the DNA report as being scientifically accurate and exact science as held by this Court in Kamti Devi v Poshi Ram (supra). In arriving at its conclusions the trial court was also influenced by the fact that the semen swabs and slides and the blood samples of the appellant had not been kept in proper custody and had been tampered with, as already indicated above. We are of the opinion that the trial court was in error on this score. We, accordingly, endorse the conclusions of the High Court on Circumstance 9.

218. In Inspector of Police, Tamil Nadu v John David[90], a young boy studying in MBBS Course was brutally murdered by his senior. The torso and head were recovered from different places which were identified by the father of the deceased. For confirming the said facts, the blood samples of the father and mother of the deceased were taken which were subject to DNA test. From the DNA, the identification of the deceased was proved. Paragraph 60 of the decision is reproduced below: "60. ... The said fact was also proved from the DNA test conducted by PW 77. PW 77 had compared the tissues taken from the severed head, torso and limbs and on the scientific analysis he has found that the same gene found in the blood of PW1 and Baby Ponnusamy was found in the recovered parts of the body and that therefore they should belong to the only missing son of PW 1."

219. In Krishan Kumar Malik v State of Haryana[91], Criminal Appeal No. 1252 of 2011, decided on 4 July 2011 (Supreme Court). in a gang rape case when the prosecution did not conduct DNA test or analysis and matching of semen of the appellant-accused with that found on the undergarments of the prosecutrix, this Court held that after the incorporation of Section 53- A in CrPC, it has become necessary for the prosecution to go in for DNA test in such type of cases. The relevant paragraph is reproduced below:

44. Now, after the incorporation of Section 53-A in the Cr.P.C w.e.f 23.06.2006, brought to our notice by the learned counsel for the respondent State, it has become necessary for the prosecution to go in for DNA test in such type of cases, facilitating the prosecution to prove its case against the accused. Prior to 2006, even without the aforesaid specific provision in CrPC the prosecution could have still restored to this procedure of getting the DNA test or analysis and matching of semen of the appellant with that found on the undergarments of the prosecutrix to make it a foolproof case, but they did not do so, thus they must face the consequences.

220. In Surendra Koli v State of Uttar Pradesh and others[92], the appellant, a serial killer, was awarded death sentence which was confirmed by the High Court. While confirming the death sentence, this Court relied on the result of the DNA test conducted on the part of the body of the deceased girl. Para 12 is reproduced below:- "12. The DNA test of Rimpa by CDFD, a pioneer institute in Hyderabad matched with that of blood of her parents and brother. The doctors at AIIMS have put the parts of the deceased girls which have been recovered by the doctors of AIIMS together. These bodies have been recovered in the presence of the doctors of AIIMS at the pointing out by the accused Surendra Koli. Thus, recovery is admissible under Section 27 of the Evidence Act."

221. In Mohammed Ajmal Mohammad Amir Kasab alias Abu Mujahid v State of Maharashtra[93], the accused was awarded death sentence on charges of killing a large number of innocent persons on 26th November, 2008 at Bombay. The accused with others had come from Pakistan using a boat 'Kuber' and several articles were recovered from 'Kuber'. The stains of sweat, saliva and other bodily secretions on those articles were subjected to DNA test and the DNA test matched with several accused. The Court observed:

222. In Sandeep v State of Uttar Pradesh[94], the facts related to the murder of pregnant paramour/girlfriend and unborn child of the accused. The DNA report confirmed that the

appellant was the father of the unborn child. The Court, relying on the DNA report, stated as follows: "67. In the light of the said expert evidence of the Junior Scientific Officer it is too late in the day for the appellant Sandeep to contend that improper preservation of the foetus would have resulted in a wrong report to the effect that the accused Sandeep was found to be the biological father of the foetus received from the deceased Jyoti.

As the said submission is not supported by any relevant material on record and as the appellant was not able to substantiate the said argument with any other supporting material, we do not find any substance in the said submission. The circumstance, namely, the report of DNA in having concluded that accused Sandeep was the biological father of the recovered foetus of Jyoti was one other relevant circumstance to prove the guilt of the said accused."

223. In Rajkumar v State of Madhya Pradesh[95], the Court was dealing with a case of rape and murder of a 14 year old girl. The DNA report established the presence of semen of the appellant in the vaginal swab of the prosecutrix. The conviction was recorded relying on the DNA report. In the said context, the following was stated:

8. The deceased was 14 years of age and a student in VIth standard which was proved from the school register and the statement of her father Iknis Jojo (PW1). Her age has also been mentioned in the FIR as 14 years. So far as medical evidence is concerned, it was mentioned that the deceased prosecutrix was about 16 years of age. So far as the analysis report of the material sent and the DNA report is concerned, it revealed that semen of the appellant was found on the vaginal swab of the deceased. The clothes of the deceased were also found having appellant's semen spots. The hair which were found near the place of occurrence were found to be that of the appellant.

224. In Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik and another[96], the appellant, father of the child born to his wife, questioned the paternity of the child on the ground that she did not stay with him for the last two years. The Court directed for DNA test. The DNA result opined that the appellant was not the biological father of the child. The Court also had the occasion to consider Section 112 of the Evidence Act which raises a presumption that birth during marriage is conclusive proof of legitimacy. The Court relied on the DNA test holding the DNA test to be scientifically accurate. The pertinent observations are extracted below:

"19. The husband's plea that he had no access to the wife when the child was begotten stands proved by the DNA test report and in the face of it, we cannot compel the appellant to bear the fatherhood of a child, when the scientific reports prove to the contrary. We are conscious that an innocent child may not be bastardised as the marriage between her mother and father was subsisting at the time of her birth, but in view of the DNA test reports and what we have observed above, we cannot forestall the consequence. It is denying the truth. "Truth must triumph" is the hallmark of justice.

20. As regards the authority of this Court in Kamti Devi, this Court on appreciation of evidence came to the conclusion that the husband had no opportunity whatsoever to have liaison with the wife. There was no DNA test held in the case. In the said background i.e. non-access of the husband to the wife, this Court held that the result of DNA test "is not enough to escape from the conclusiveness of Section 112 of the Act."

The judgment has to be understood in the factual scenario of the said case. The said judgment has not held that DNA test is to be ignored. In fact, this Court has taken note of the fact that DNA test is scientifically accurate. We hasten to add that in none of the cases referred to above, this Court confronted with a situation in which a DNA test report, in fact, was available and was in conflict with the presumption of conclusive proof of the legitimacy of the child under Section 112 of the Evidence Act.

In view of what we have observed above, these judgments in no way advance the case of the respondents." From the aforesaid authorities, it is quite clear that DNA report deserves to be accepted unless it is absolutely dented and for non- acceptance of the same, it is to be established that there had been no quality control or quality assurance. If the sampling is proper and if there is no evidence as to tampering of samples, the DNA test report is to be accepted.

225. In order to establish a clear link between the accused persons and the incident at hand, the prosecution has also adduced scientific evidence in the form of DNA, fingerprint and bite mark analysis.

226. Various samples, for the purpose of DNA profiling, were lifted from the person of the prosecutrix; the informant; the accused, their clothes/articles; the dumping spot; the iron rods; the ashes of partly burnt clothes; as well as from the offending bus. PW-45, Dr. B.K. Mohapatra, analysed the said DNA profiles and submitted his report thereof. In his report, he concluded that the samples were authentic and capable of establishing the identities of the persons concerned beyond reasonable doubt.

guidelines and methodology documented in the Working Procedure Manuals of the laboratory which have been validated and recommended for use in the laboratory. He further added that once a DNA profile is generated, its accuracy is 100%. The trial court and the High Court have consistently noted that the counsel for the defence did not raise any substantial ground to challenge the DNA report during the cross-examination of PW-45. In such circumstances, there is no reason to declare the DNA report as inaccurate, especially when it clearly links the accused persons with the incident.

227. After establishing the identities of each of the accused persons, the informant and the prosecutrix through DNA analysis, ***the DNA profiles*** *generated from the remaining samples, where the identity of biological material found thereon needed to be ascertained, were matched with the DNA profiles of the prosecutrix, the informant and the accused, generated earlier from known samples. Such an analysis cogently linked each of the accused with the victims as also with the crime scene. A summary of the findings in the report submitted by PW-45, Dr. B.K. Mohapatra, is as under:*

"S.No.	*Accused*	*DNA EVIDENCE*
1	*Ram Singh*	*Rectal swab from the prosecutrix contained DNA of male origin, which was found consistent with the DNA developed from the blood sample of this accused.*
		DNA profile developed from the blood stains from the underwear, T-shirt and slippers of this accused was found consistent with the DNA of the prosecutrix.
2	*Mukesh*	*DNA profile developed from the blood stains from the pants, T-shirt and jacket of this accused was found consistent with the DNA of the prosecutrix.*
3	*Akshay*	*Breast swab of the prosecutrix contained DNA of male origin which was found consistent with the DNA of this accused.*
		DNA profile developed from the blood stains from the jeans of this accused was found consistent with the DNA of the prosecutrix.
4	*Vinay*	*DNA profile developed from the blood stains from the underwear, jacket and slippers of this accused was found consistent with the DNA of the prosecutrix.*
5	*Pawan*	*DNA profile developed from the blood stains from the sweater and shoes and slippers of this accused was found consistent with the DNA of the prosecutrix."*

228. Further, a summary of the DNA analysis of the biological samples lifted from the material objects such as the bus, the iron rods, and the ash and unburnt pieces of clothes is also worth producing here:

"Serial No.	*Identity of the victim*	*Findings of DNA Analysis*
	Informant	*The DNA profile developed from burnt clothes pieces were found to be of male origin and was consistent with the DNA profile of complainant.*
		The bunch of DNA profile developed from hair and blood stained pieces of paper recovered from the bus was found consistent with the DNA profile of complainant.
		The DNA profile developed from blood stained dried leaves collected from the place where both the victims were thrown matched with the DNA profile of complainant.
	Prosecutrix	*The DNA profile developed from blood stains from both the iron rods recovered at the instance of accused Ram Singh from bus was of female origin and was consistent with the DNA profile of prosecutrix.*
		The DNA profile developed from blood stains from curtains of the bus matched with the DNA profile of prosecutrix.

		The DNA profile developed from blood stains from seat covers was found consistent with the DNA profile of prosecutrix.
		DNA profile developed from blood stains from the bunch of the hair recovered from floor of the bus below sixth row seat, blood stains prepared from the roof of the bus near back gate, blood stains prepared from the floor of the bus near back gate, blood stains taken from side of back stairs of the bus, and blood stains taken from the inner side of the back door of the bus was found consistent with the DNA profile of prosecutrix.

230. Mr. Sharma, learned counsel appearing for appellants - Mukesh and Pawan Kumar Gupta, submitted that in the instant case, the DNA test cannot be treated to be accurate, for there was blood transfusion as the prosecutrix required blood and when there is mixing of blood, the DNA profiling is likely to differ. It is seemly to note, nothing had been put to the expert in his cross-examination in this regard. As the authorities relating to DNA would show, if the quality control is maintained, it is treated to be quite accurate and as the same has been established, we are compelled to repel the said submission of Mr. Sharma.

20.11.2.1 The evidence relating to finger print analysis:

231. Next aspect that is required to be adverted is the **evidence of fingerprint analysis** adduced by the prosecution to establish the identity of the accused persons. By virtue of the finger print analysis, the prosecution has tried mainly to establish the presence of the accused in the offending bus. On 17.12.2012 and 18.12.2012, a team of experts from the CFSL had lifted chance finger prints from the concerned bus, Ex.P-1, at Thyagraj Stadium. On 28.12.2012, PW-78, Inspector Anil Sharma of P.S. Vasant Vihar, the then S.H.O. of Police Station Vasant Vihar, requested the Director, CFSL for taking digital palm prints and foot prints of all the accused persons vide his letter Ex.PW-46/C. Pursuant to the said request made by PW-78, Inspector Anil Sharma, the CFSL on 31.12.2012 took the finger/palm prints and foot prints of the accused persons at Tihar Jail. After comparing the chance prints lifted from the bus with the finger prints/palm prints and foot prints of all the accused persons, PW-46, Shri A.D. Shah, Senior Scientific Officer (Finger Prints), CFSL, CBI, submitted his report, Ex.PW-46/D.

232. As per the report, Ex.PW-46/D, the result of the aforesaid examination of the Finger Print Division of the CFSL, CBI, New Delhi was that the chance prints of accused Vinay Sharma were found on the bus in question. The relevant portion of the report is as under:

Result of Examination

1. The chance print marked as Q.1 is identical with left palmprint specimen of Vinay Sharma S/o Sh.Hari Ram Sharma marked here as LPS-28 on the slip marked here as S.28 (Matching ridge characteristics have been found in their relative positions in the chance palmprint and specimen palm print. This forms the basis of the opinion that these prints are identical. Eight of them have been marked with projected red lines with their detailed description are placed at Annexure-1)

II. The chance print marked as Q.4 is identical with right thumb impression of Vinay Sharma S/o Sh.Hari Ram Sharma marked here as RTS-23 on the slip marked here as S.23 (Matching ridge characteristics have been found in their relative positions in the chance print and specimen finger print. This forms the basis of the opinion that these prints are identical. Eight of them have been marked with projected red lines with their detailed description are placed at Annexure-2)." The above report incontrovertibly proves that accused Vinay was present in the bus at the time of the incident. Be it noted, the other chance prints were found to be unfit for comparison or different from specimen print.

The comparison also shows that there is a concordance in terms of general alignment and angulation of the biting surfaces of the teeth of the lower jaw on the dental models of the accused person with the name Akshay and the corresponding bite marks visible on

Photograph No.5. In particular, the comparison revealed concordance between the biting surface of the teeth on the lower jaw of the dental models of the accused person with the name Akshay and the bite mark visible on Photograph No.5 in relation to the rotated left first incisor whose mesial surface pointed towards the tongue.

Overall, the bite mark shows some degree of specificity to the accused person's teeth by virtue of a number of concordant points, including one corresponding unconventional/ individual characteristic. There is an absence of any unexplainable discrepancies between the bite mark and the biting surfaces of this accused person's teeth. Therefore, the teeth on the dental models of the accused person with the name Akshay probably caused the bite marks visible on Photograph No.5."

239. Be it noted, the present is a case where the victim's body contained various white bite marks. Bite mark analysis play an important role in the criminal justice system. Advanced development of technology such as laser scanning, scanning electron microscopy or cone beam computed tomography in forensic odontology is utilized to identify more details in bite marks and in the individual teeth of the bite. Unlike fingerprints and DNA, bite marks lack the specificity and durability as the human teeth may change over time.

However, bite mark evidence has other advantages in the criminal justice system that links a specific individual to the crime or victim. For a bite mark analysis, it must contain abundant information and the tooth that made the mark must be quite distinctive.

240. Bite marks in skin are photographed in cases where the suspect is apprehended. A thorough dental combination is administered after dental examination of the suspect. Final comparison of the details of the original mark with the dentation of the suspect is done by experts.

241. The bite marks generally include only a limited number of teeth. The teeth and oral structure of the accused are examined by experts and, thereafter, bite marks are compared and reports are submitted. Forensic Odontology is a science and the most common application of Forensic Odontology is for the purpose of identification of persons from their tooth structure.

242. Forensic Odontology has established itself as an important and indispensable science in medico-legal matters and expert evidence through various reports which have been utilized by courts in the administration of justice. In the case at hand, the report is wholly credible because of matching of bite marks with the tooth structure of the accused persons and there is no reason to view the same with any suspicion. Learned counsel for the appellants would only contend that the whole thing has been stage- managed. We are not impressed by the said submission, for the evidence brought on record cogently establish the injuries sustained by the prosecutrix and there is consistency between the injuries and the report. We are not inclined to accept the hypothesis that bite marks have been managed. Acceptability of the plea of alibi

"**Aggravating circumstances**: A court may, however, in the following cases impose the penalty of death in its discretion:

(a) if the murder has been committed after previous planning and involves extreme brutality; or

(b) if the murder involves exceptional depravity; or

(c) if the murder is of a member of any of the armed forces of the Union or of a member of any police force or of any public servant and was committed-

(i) while such member or public servant was on duty; or

(ii) in consequence of anything done or attempted to be done by such member or public servant in the lawful discharge of his duty as such member or public servant whether at the time of murder he was such member or public servant, as the case may be, or had ceased to be such member or public servant; or

(d) if the murder is of a person who had acted in the lawful discharge of his duty under Section 43 of the Code of Criminal Procedure, 1973, or who had rendered assistance to a Magistrate or a police officer demanding his aid or requiring his assistance under Section 37 and Section 129 of the said Code." After reproducing the same, the Court opined: "Stated broadly, there can be no objection to the acceptance of these indicators but as we

have indicated already, we would prefer not to fetter judicial discretion by attempting to make an exhaustive enumeration one way or the other."

333. Thereafter, the Court referred to the suggestions pertaining to mitigating circumstances: "Mitigating circumstances.-In the exercise of its discretion in the above cases, the court shall take into account the following circumstances:

(1) That the offence was committed under the influence of extreme mental or emotional disturbance.

(2) The age of the accused. If the accused is young or old, he shall not be sentenced to death.

(3) The probability that the accused would not commit criminal acts of violence as would constitute a continuing threat to society.

(4) The probability that the accused can be reformed and rehabilitated. The State shall by evidence prove that the accused does not satisfy the conditions (3) and (4) above.

(5) That in the facts and circumstances of the case the accused believed that he was morally justified in committing the offence.

(6) That the accused acted under the duress or domination of another person.

(7) That the condition of the accused showed that he was mentally defective and that the said defect impaired his capacity to appreciate the criminality of his conduct." The Court then observed: "We will do no more than to say that these are undoubtedly relevant circumstances and must be given great weight in the determination of sentence."

337. the singular conclusion that the aggravating circumstances outweigh the mitigating circumstances now brought on record. Therefore, we conclude and hold that the High Court has correctly confirmed the death penalty and we see no reason to differ with the same.

357. ***When we cautiously, consciously and anxiously weigh the aggravating circumstances and the mitigating factors, we are compelled to arrive at the singular conclusion that the aggravating circumstances outweigh the mitigating circumstances now brought on record. Therefore, we conclude and hold that the High Court has correctly confirmed the death penalty and we see no reason to differ with the same.***

20.11.3 Corroboration not Necessary[7]

Author's Summary

Corroboration in rape cases is not a legal requirement (EA).
Quoted SC: "*The tender years of the child, coupled with other circumstances appearing in the case, such, for example, absence of motive to falsely implicate the accused, its demeanour, unlikelihood of tutoring and so forth, may render corroboration unnecessary*".

Relevant Extracts (Verbatim)[8]

The learned advocate asked us to look for corroboration of the evidence of the victim on the ground that rape has often been described as the easiest charge to make and the most difficult to refute: *Karichiappa Goundan (re:)*. The question of corroboration has been the subject-matter of a decision of the Supreme Court in *Rameshwar v State of Rajasthan*[9]. In that case the appellant was charged with committing rape on a young girl, eight years of age. The learned Sessions Judge held that the evidence was sufficient for moral conviction but fell short of legal proof because, in his opinion, the law requires corroboration of the story of the prosecutrix connecting the appellant with the crime. He was satisfied, however, that the girl had been raped by somebody.

7. Re *Anthony,* AIR 1960 Mad 308 : 1960 Cri LJ 927 (Mad).
8. AIR 1942 Mad 285 : 43 Cri L J 576.
9. AIR 1952 SC 54 : 1952 Cr LJ 547 : 1952 SCR 377.

Accordingly he acquitted the accused. In the appeal by the State against acquittal the High Court held that the law requires corroboration in such cases but held that the girl's statement made to her mother was sufficient corroboration and setting aside the acquittal convicted the appellant. On appeal to the Supreme Court it was held: The first question is whether the law requires corroboration in these cases. The Evidence Act nowhere says so. A woman who has been raped is not an accomplice. If she was ravished she is the victim of the outrage: In the case of a girl below the age of consent, her consent will not matter. The learned High Court Judges were wrong in thinking that they could not, as a matter of law, convict without corroboration. but that is a question of fact in every case.

In this case no corroboration beyond the statement of the child to her mother was necessary. The appeal was dismissed. How the principles laid down in the Supreme Court decision should be applied are set out in *Public Prosecutor Mohini Sankara Das*, 1956 Andh WR 572 and *State Govt. of Madhya Pradesh v Sheodayal Gurudayal*, AIR 1956 Nag 8 : 1956 Cr LJ 83 : ILR 1955 Nag 731; *Dulichand v State*, AIR 1952 Ajmer 54 : 1952 Cr LJ 1575; *See* also *Boya Chinnappa (re)*, AIR 1951 Mad 760 : (1951) 1 Mad LJ 110 : 1951 Cr LJ 718(2). How tell-tale smegma on the person of the accused will also corroborate the prosecutrix; see *Ramkala Prasad v Emperor*, AIR 1946 All 191 : 47 Cr LJ 611; *Harendra Prosad v Emperor*, ILR (1940) 2 Cal 180 : 44 Cal WN 830 : AIR 1940 Cal 461.[1]

20.11.4 Special Situation[10]

Author's Summary

A woman with 2" prolapsed was raped. There was no profuse bleeding. However there were semen stains of the rapist on the clothes of the victim. Unfortunately, the identification of semen was not linked to the culprit. The court acquitted the accused. It is a case of utter Unfortunate callousness on the part of all concerned!

Relevant Extracts (Verbatim)

The medical examination of the prosecutrix shows that she had a prolapse of the uterus about 2" outside her vulva. A forcible intercourse with such a woman would have certainly given a copious discharge of blood at the time. The report of the chemical examiner, on the other hand, goes to show that there was only one small patch of blood on the ghaghra of the prosecutrix. The presence of semen on the clothes of the appellant and the prosecutrix by itself, in my opinion, carries, no weight whatsoever for, admittedly, both of them are married persons and had been putting on the same clothes for a considerable time.

20.11.5 Delay in Despatch[11]

Author's Summary

Delay of in despatch of vaginal swab, after 4 months ,was declared worthless. It could have been tampered with.

Relevant Extracts (Verbatim)

Another very suspicious feature in this case is the evidence relating to taking a swab. That it is said was done on November 12, but for some reason, it was not sent to chemical examiner until March, 1951. Much can happen to a swab in the meantime and therefore the evidence of the chemical examiner as to the examination of the swab is really worthless.

10. *Har Nath v State of Rajasthan*, AIR 1952 Ajmer 49 : 1952 Cri LJ 1563 (Ajmer).
11. *Arabinda Dey v State of West Bengal,* AIR 1953 Cal 206 : 1953 Cr LJ 511 (Cal).

20.11.6 Life of Sperms[12]

Author's Summary

The advocate erroneously thought that the sperms in the vagina can be located for only a few hours. So, he made a wild charge that the sperms found after 2 days were introduce artificially. The wild charge was rejected and the rapist convicted.

Sperms have been identified from the vaginal swabs even up to a week.

Relevant Extracts (Verbatim)

Mr. Mitter therefore argued on the life of spermatozoa stating that beyond a few hours the spermatozoa could not live. Therefore, he argued that if any sexual intercourse had taken place on the 18th March, 1960, the spermatozoa could not be found on an examination on the 20th March, 1960, especially the girl had washed herself and answered call of nature during the period of time between the alleged crime and the medical examination. Therefore Mr. Mitter builds up the theory of artificial introduction of semen to *Hayatunnessa* by the police. He did not accuse the doctors. This suggestion of artificial insemination or artificial introduction was never made either to the investigating officer or to the doctors. To say the least, we consider this suggestion to be wild. Opinion and views expressed in medical text books that the life of spermatozoa is only a few hours after intercourse cannot help Mr. Mitter. Dead spermatozoa could still be found. It is not necessary to find live and active spermatozoa. Mr. Mitter tries to argue on the basis of medical authorities that the spermatozoa after death disintegrates, but he has not been able to show how long it takes spermatozoa to disintegrate so completely that even their presence cannot be detected. The fact remains that the chemical examiner definitely found spermatozoa in the vaginal smears and vaginal swabs of *Hayatunnessa*.

The swabs and smears were taken by responsible doctors, who, we believe, were true to their professional code. They were sent under sealed covers as exhibit 37 shows. Not the remotest suggestion was made in cross-examination that the seals were broken or tampered with by anybody.

We, therefore, hold that the medical opinion and the chemical examiner's report corroborate *Hayatunnessa's* evidence of rape.

20.11.7 Blood and Semen[13]

Author's Summary

The oral evidence, circumstantial evidence, the evidence on the persons on the victim/rapist and concurrent finding of three lower courts sealed the fate of the rapist.

Relevant Extracts (Verbatim)

1. We are satisfied and, indeed, Shri Mukherji fairly admitted, that the six-year-old Anjali had been the victim of rape on the date set out by the prosecution. The main point on which counsel laid stress was the identity of the criminal. The plea of the appellant was one of the total denial, which was consistently disbelieved at the forensic triple-decks through which it had passed. There is evidence of Anjali and her mother. The playmate Ashok (P.W. 2) has given corroborating testimony. The first information has been prompt and has implicated the accused. There was blood on the genitals of the appellant to explain which he invented the story of itches

12. *AW Khan v State of West Bengal*, AIR 1962 Cal 641 : 1963 All Cri R 11 : (1962) 2 Cr LJ 751 (Cal). See also *State of Orissa v Pichika Parvatisam*, AIR 1963 Ori 52 : (1963) 1 Cr LJ 310 : ILR 1962 Cut 781.
13. *RK Agarwal v State of Orissa*, AIR 1976 SC 1974 : (1976) 2 SCC 177 : 1976 Cr LJ 1376; See also *State of Bombay v Hiraman Punjab Vidhati,* (1965) 2 Cr LJ 349 (Bom); *Mushtaq v State of Uttar Pradesh*, AIR 1954 All 580 : 1954 All LJ 256 : 1954 Cr LJ 1288 (All).

and scratches thereof. It is true that while the evidence before the committal court has been consistent and total, implicating the accused, there has been some wobbling in the trial court on the part of the little girl and her mother, for reasons not far to seek. Even so, the evidence in the trial court is explicit enough to implicate the accused, even apart from the depositions in the committal court, which have been read as evidence under section 288, Code of Criminal Procedure. There are corroborating materials inescapably fixing the guilt on the accused, such as the bloodstain on his clothing. Even assuming that the evidence of little children requires general corroboration, we are satisfied that the proved circumstances that the girl was playing in broad day-light that she was carried away by the accused and brought back crying after a time, that there was a first information lodged before the police shortly thereafter, that the medical examination of the accused's genitals indicated the presence of spermatozoa, are sufficiently corroborative of the guilt of the appellant. Even otherwise, the grave injustice, manifest on the record, can induce this court to demolish the concurrent findings of guilt by the three courts below. There is little to be said for such a drastic step in the circumstances unfolded in this case.

20.11.8 Semen on wearing apparels[14]

Author's Summary

The victim was forcibly put into a car by the accused persons, took her to the place in a village and raped there. The wearing apparels of the victim as well as the accused persons were sent for analysis to the FSL where Human Semen was detected on Salwar, Lady's Shirt and Shameez. The report of the FSL corroborates the version put forward by the victim. The conviction of the accused is justified.

Relevant Extracts (Verbatim)

The High Court by reversing the order of acquittal of the learned trial Court, has convicted the accused appellants under Section 376 of the IPC is under challenge in the present appeal.

The victim, herself deposed in great detail as to how she was forcibly put into a car by the accused persons who took her to the place of occurrence in a village where the crime was committed. In the course of the investigation the wearing apparels of the victim as well as the accused persons were collected and sent for analysis to the Forensic Science Laboratory (FSL). The report of the FSL corroborates the version put forward by the victim. The report of the FSL in respect of the victim shows that Human Semen was detected on Salwar, Lady's Shirt and Shameez. However, semen could not be detected on Chunni, Vaginal swab, Pubic hairs and Blood stained piece of cloth. Thus the conviction of the accused appellants ordered by the High Court is perfectly justified.

In *Chhangu Passi v State of UP,* 2018 (6) ALJ 33, while examining Tai of the victim she had stated that on the date of incident at the time when she was collecting kandi then some children of the village informed her that the victim was lying in arhar field in unconscious position. Then she went there and saw that underwear of the victim was drenched with blood. Thereafter she took the victim to her house. After regaining consciousness, the victim had informed that the appellant had committed rape with her and thereafter FIR of the incident was promptly lodged on that very day. The evidence of witnesses which are corroborative evidence of fact subsequent to the incident are fully proved. Thus there is no illegality in the judgment of the Court below in convicting the appellant under Section 376, IPC.

However, the counsel for the appellant has submitted that statement given by the victim in examination-in chief is tutored statement and no reliance can be placed on it. Although she had stated in cross-examination that this statement was given by her as tutored by her father but in the end she had specifically denied that it was incorrect to say that appellant had not committed

14. *Ajay v State of Haryana*, Criminal Appeal Nos. 888 of 2015, decided on 8 August 2018 (SC).

rape with her. The victim was an eight years old girl at the time of incident and if some questions were answered in the manner on which the questions were put to her in cross-examination then on that basis her statement was not liable to be disbelieved. From the medical evidence it is also fully proved that victim was raped. From Forensic Laboratory report, it was also proved that sperm of human was present on the underwear of the victim. Thus suggestion of the counsel for the applicant that injury was received in any other manner and the victim was not raped, is not liable to be accepted inasmuch as if injury was received in any other manner then there was no occasion that sperm of human found on the underwear of the victim.

In *Shankar Singh S/o Nathu Singh vs State of Rajasthan,* 2019 Cr LJ 3088 (Raj HC, Jaipur Bench), the appellant on the next day of the occurrence suffered a disclosure statement wherein he stated that he can get the dead body of the deceased recovered. In pursuance of disclosure statement, vide Recovery Memo appellant got the dead body recovered from a drain behind the hill. The Recovery Memo was witnessed by the witnesses. One of them in the Court stated that the accused led the police party to the spot where the dead body was lying and also got recovered the same. This witness also witnessed the various recoveries effected from spot which included clothes and underwear of the victim-child. The frock of the deceased was sent to the Forensic Science Laboratory along with various other articles. The report submitted by the Forensic Science Laboratory proves that on the frock of the deceased semen of accused was found. Further the testimony of recovery witnesses is sufficient to complete the chain of circumstances to arrive at the conclusion that the offence has been committed by the appellant and by none else.

20.11.9 Venereal Disease Infection[15]

Author's Summary

Venereal disease was found on the person of the gang-rape victim. The examination of the rapists for the disease could identify/eliminate the rapist (s). However, all concerned with the investigation/examination/supervision failed to do their duty—unpardonable negligence!

Relevant Extracts (Verbatim)

It is a well-known rule (see *Modi's Medical Jurisprudence,* 10th Edn., p. 303 and p. 305) that in cases of rape the alleged victim and the accused persons should be specially inspected for venereal diseases. Dr. Jadunath Kar (P.W. 1) who medically examined the girl Bimali Devi took special care to collect some smear from the vagina of the girl and sent it to the chemical examiner from whose report it appears that the girl was infected with gonorrhea. Dr. Harekrushna Parija (P.W. 2), however, has not stated that he examined the accused persons with a view to ascertain if any of them was infected with venereal diseases. His evidence is entirely silent on this subject. Any medical officer with some knowledge of medical jurisprudence is expected to know that in cases of rape the accused ought to be specially examined for signs of venereal disease, if any.

Even if this medical officer overlooked this point, the investigating police officer or the superior police officers who supervised the case ought to have sent a special request to the medical officer to further examine the accused persons to find out if there were signs of venereal disease. Unfortunately, this was not done with the result that an important piece of evidence was lost. If any of the accused persons was found to suffer from gonorrhoea that would be the strongest piece of corroborative evidence of the girl's statement incriminating that accused. On the other

15. *Anam Swain v State of Orissa*, AIR 1954 Ori 33 : 1954 Cr LJ 132 : 19 Cut LT 14; See also *Rameswar v State of Rajasthan*, AIR 1952 SC 54 : 1952 SCR 377 : 1952 Cr LJ 547 (SC); (a) For faked rape: *Gangaram Nanhoosingh v Crown*, 1950 Cr LJ 244 (Nag); (b) Rape not proved: *Rajput Bhima Karasan v Kutch Government,* 1950 Cr LJ 396 (Kutch); (c) Unnatural Offence: *Lobana Vasantlal Devchand v State of Gujarat*, 1968 Cr LJ 1277.

hand, if none of the accused was found to suffer from gonorrhoea that circumstance itself would completely disprove the girl's allegation of rape by the accused persons because according to her evidence that was the first time when any person had sexual intercourse with her.

20.11.10 Spermatozoon Necessary[16]

Author's Summary

In the absence of DNA analysis, the identification of sperms was considered essential for the identification of semen. DNA has dispensed with the necessity! The present case appears to be a false accusation. Besides investigation were also lop-sided. Was it influence of the accused? Or, was it connivance of the females?

Relevant Extracts (Verbatim)

The wearing saris of both the women and underwears of Manik and Narayan were seized under the seizure list Ext. 1. The sari of Samiran (P.W. 10) was of light blue colour check-black bordered, which was marked as C and D by the chemical examiner. No spermatozoon could be detected in these exhibits. What is more striking is P.W. 10 was recalled to say that the green sari was worn by her that night. This was marked A by the Chemical Examiner and spermatozoon had been detected therein (Ext. 8) but the origin or groups of semen could not be detected. Be that as it may P.W. 10 was not a truthful witness at all and she had no hesitation to give apparent lies for securing a conviction.

It is also striking that the appellant though arrested on that very nights was not produced before Dr. Pal, (P.W. 11) who examined P.Ws. 1 and 10 on 10-5-70. No injury was found on the person of P.W. 10 suggesting resistance to violence.

20.11.11 Un-exhibited Report[17]

In the file of committal courts, there is an unexhibited report of Chemical Examiner. A reading of that report would show that no seminal stains and spermatozoa could be detected on article-A *i.e.,* Shantibai's Sari. It is further stated in the report that vaginal slides of the girl were not received by the Chemical Examiner although it was mentioned in the memo of the S.P. that those were also sent to Chemical Examiner for chemical examination. The story of Shantibai (P.W. 1) was that her Sari has got soiled by acts of discharges during the course of the incident by the appellants. She had gone to the length of producing the soiled Sari at the time of making her report. That Sari was seized by the police and sent for chemical examination. The report of the Chemical Examiner, already indicated, contra-indicates the story of any sexual intercourse having taken place with the prosecutrix. The law with respect to unproved prosecution documents appears to be that although the prosecution cannot be allowed to use them, the defence cannot be denied their use if those documents support the defence in any manner. In the case *Shivprasad v Emperor*, (1938) 39 Cr LJ 917 (Nag HC) : AIR 1938 Ngp 934, the FIR was not proved by the prosecution. It was held that the defence could not be shut out from using that document, merely because the prosecution had not formally proved it. If the prosecution wished to imply that FIR was a garbled document, it should have given evidence to that effect. In the absence of such evidence, the defence could legitimately make use of that document. Another case *Samedas v State of Madhya Pradesh*[18], also related to unproved FIR. It was not proved and hence could not be exhibited in the case. It was held that the prosecution could not be allowed to use it because it had remained unproved. But even so it was open to

16. *Narayan Dutta v State,* 1980 Cr LJ 264.
17. *Shatrughan v State of Madhya Pradesh*, 1993 Cri LJ 120 : 1992 (2) CLC 394 : 1992 (1) Crimes 889.
18. 1969 Jab LJ (SN) 54.

the defence to make use of it, if it supported the defence in any manner. In the present case the unexhibited report of the Chemical Examiner did not in fact require to be formally proved by any witness. It was a document which proved itself under section 293 of the Code of Criminal Procedure and should have been exhibited even if it was not referred to in the deposition of any witness. That report stood on an obviously better footing than an unproved FIR. The defence could be legitimately allowed to make use of it. When so considered, it militates against the prosecution story about any sexual intercourse having taken place with the prosecutrix.

20.11.12 Injuries[19]

Author's Summary

In a rape of 5 year old girl there were no injuries to the victim. Likewise, there were no injury to the penis of the rapist. However, there was no smegma in the penis. Absence of injuries is possible if there was no full penetration. Th rapist was convicted

Relevant Extracts (Verbatim)

1. It is true that Dr. H.S. Amwani found no injury on the genital region or anywhere in the appellant's body and no clotting of the hair. In the opinion of the doctor, there were no signs of struggle, but the absence of smegma around the corona suggested that there could have been sexual intercourse. There could possibly be no injury caused to the appellant at the hands of the raped girl because she was only five years old. As for the absence of injuries on the genital region of the appellant, Dr. H.S. Amwani was of the view that if there was no full penetration there would be no lacerations on the triennium of the penis. He further explained that if only the corona went inside the private parts of the girl, there would be no lacerations.

In *Modi's Medical Jurisprudence and Toxicology*, 14th Edn. at p. 339, it is mentioned that:

> *Modi had seen cases in which there was no injury to the penis of the accused although there were lacerations of the hymen, posterior perineum and even the vaginal walls of the victim.*

In *Taylor's Principles and Practice of Medical Jurisprudence*, 10th Edn. at p. 83, the case of *R. v Cowley* has been quoted in which the prisoner, aged twenty-four, was tried for a criminal assault on his own daughter Catherine, aged less than 4 years. The labia majora of the girl was swollen and bruised. The fourchette has been torn across as well as the posterior wall of the vagina, for a depth of over a quarter of an inch extending backwards; from this there was a laceration which came up to the anterior wall of the rectum. The anterior part of the external sphincter, *i.e.*, that part between the anal orifice and the central tendon of the perineum had been torn. There was bleeding on her private parts, and even on admission to hospital there was slight oozing of blood. The prisoner himself desired to be examined by a doctor. No marks of violence on his person nor any stains of blood or semen were found. The apron in which the child had been wrapped when she was taken to the hospital contained blood and spermatozoa on one spot and blood only on the other. Nothing was found elsewhere. The prisoner's pudenda was unusually clean for a man of his employment and cleaner than the rest of the body. The jury wishes to know why no marks of violence were found on the prisoner, and the medical witness had stated that the male organ, being pressed against the soft parts would not show marks of violence. The prisoner was on the evidence convicted and sentenced to 10 years' penal servitude.

This case and the medical evidence produced in that case supports what has been said in Modi's *Medical Jurisprudence and Toxicology* that there are cases in which in spite of all these injuries on the private parts of the victim, there may be no injury whatsoever on the penis of the accused. It would not be, therefore, correct to discard the prosecution evidence only on the basis that no injuries were found on the person of the appellant.

19. *Dalchand v State of Uttar Pradesh*, AIR 1969 All 216 : ILR (1968) 1 All 352 : 1969 Cr LJ 585(2) (All). See also *Duli Chand v State of Rajasthan*, 1952 Cr LJ 1575 (Ajmer).

CHAPTER 21

DNA PROFILING

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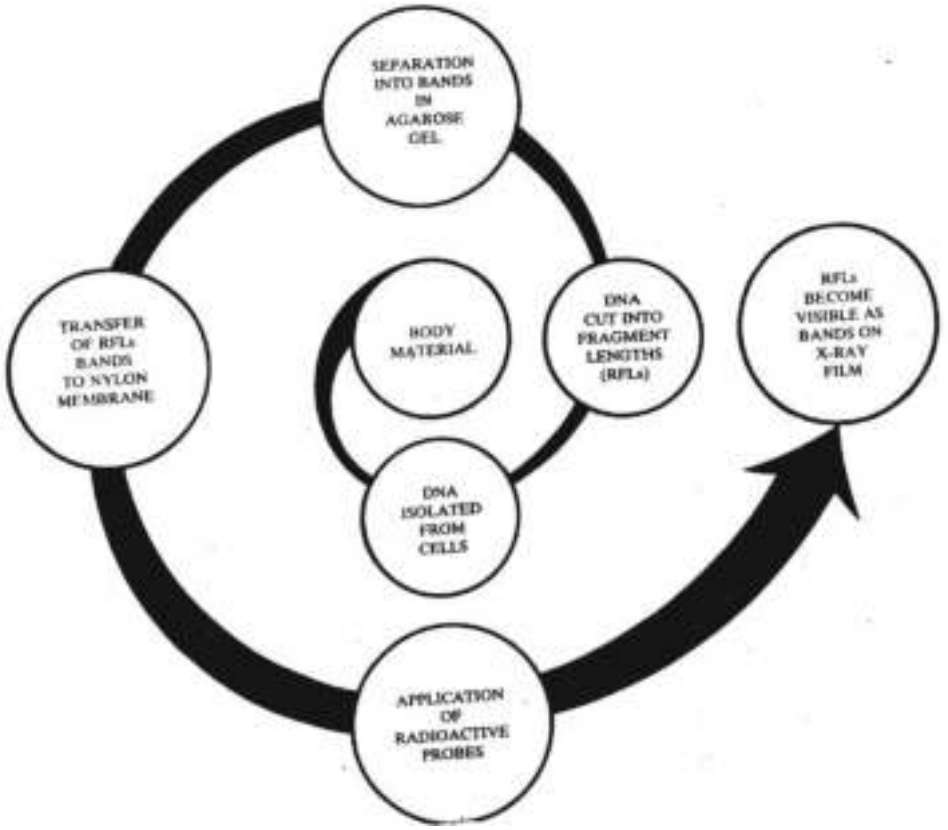

SEPARATION INTO BANDS IN AGAROSE GEL
TRANSFER OF RFLs BANDS TO NYLON MEMBRANE
BODY MATERIAL
DNA CUT INTO FRAGMENT LENGTHS (RFLs)
RFLs BECOME VISIBLE AS BANDS ON X-RAY FILM
DNA ISOLATED FROM CELLS
APPLICATION OF RADIOACTIVE PROBES

Fig. 21.1
DNA processing

21.1 NATURE

DNA profiling is a process by which the unique profile of the DNA of a person is determined. 99.9% of the DNA of all human beings is the same. Only 0.1% DNA differs. It is this part of DNA, which is used for DNA profiling.

DNA is deoxyribonucleic acid. It is the basic genetic material in all human body cells and other living beings. It carries the genetic code. It is present in human white blood corpuscles. Red blood corpuscles do not have DNA. It is inherited from both the parents.

DNA is a complex molecule, called nucleotide. It has a double helix structure, which can be compared with a twisted rope "ladder". The side arms of the "ladder" are made of sugars and phosphates. The rungs of the "ladder" are made of two pairs of four bases:

1. Adenine (A)
2. Thymine (T)
3. Cytosine (C)
4. Guanine (G)

One pair is made of the first two bases, adenine and thymine and it forms one rung of the "ladder", each base emanating from either of the two arms and joining in-between. The last two, cytosine and guanine, form the other pair and the other rung of the "ladder". The bases of one pair do not interchange with the bases of the other pair.

The "ladder" thus formed, is twisted and each twist consists of ten pairs — ten rungs. One DNA molecule has more than one billion of these base pairs.

DNA structure, the order of these bases, determines human character, behaviour and body characteristics, even diseases.

These base pairs are further compacted into parts known as alleles/mini-satellites. They have several thousand such bases. Molecular biologists have been tinkering with DNA molecules to study the diseases and other inheritance aspects.

The structure of DNA (the arrangement of these base pairs) varies from individual to individual. Each individual, consequently, is unique — different from all others. In monozygotic twins, DNA structure is the same for the twins because the division of a same single fertilised egg creates them. Monozygotic twins are genetically identical.

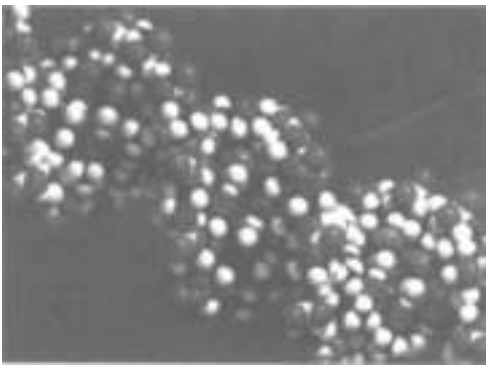


Fig. 21.2

DNA Molecule (Double Helix - 'the Twisted Rope Ladder')

DNA profiles are the structural pattern of the DNA molecule, the disposition of its constituents (base pairs). More than 99.9% of parts of the DNA are similar in several individuals, and only the remaining 0.1% determines the unique DNA profile of an individual. It is determined by comparison of two or more of the 13 STRs in the questioned and standard samples. They determine the individuality of a person and reflect his/her DNA makeup. The STR profiles are used mainly to identify human beings and other living entities, in forensics.

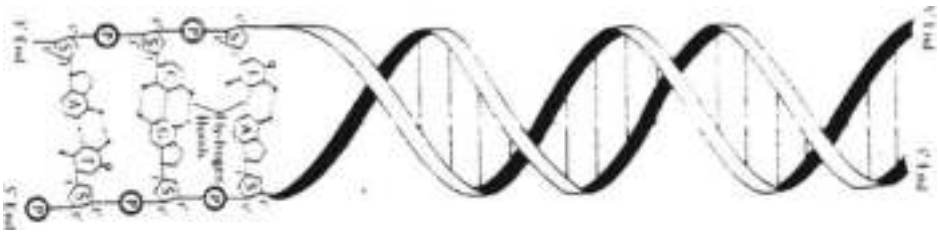


Fig. 21.3
The Watson-Crik Model of DNA

Intensive investigations of the DNA have revealed that:

1. The base pairs are compacted into units, which are repeated in the DNA molecule at a periodicity, which varies with the various individuals.
2. The length of these basic units, fragment lengths (FL) vary with different individuals.
3. If the purified DNA molecule is subject to the action of Restriction Enzymes (RE), under controlled conditions, the cleavage of the DNA double stranded-molecule takes place at sequence-specific points in the molecule, giving specific Restriction Fragment lengths (RFL).
4. The RFLs vary from one individual to another. This length variation phenomenon is called Restriction Fragment Length Polymorphism (RFLP). The variations in the fragment length can be due to a number of reasons:
   - There are several kinds of genome level differences in individuals.
   - The mutation alters the base sequence restriction enzyme recognition sites and thus creates new sites or eliminates original ones.
   - The mutation may insert or eliminate DNA building blocks between the boundaries defined by two cleavage sites.
   - RFLPs are present both in nucleic and mitochondrial DNA. Nucleic RFLPs are inherited in accordance with the Mendelian principles from both parents. Hence, they provide excellent information to determine a blood relationship.

21.1.1 Mitochondrial DNA

Mitochondria are body gene contained in eukaryotic cells, responsible for cellular respiration and for the generation of Adenosine Tri-Phosphate (ATP) — an important body constituent for the transfer of energy in living cells. Mitochondrial genes give mitochondrial DNA (*mt*DNA). It does not follow the Mendelian inheritance law. The mitochondrial genes are inherited from the mother only. The father is not involved in their inheritance. Hence, mitochondrial genes cannot be used to determine the fatherhood of a person or child. They, however, link the mother and other maternal females.

The basic composition of mitochondrial DNA and its shape vary from nucleic DNA. The functions also vary.

Human mitochondria contain 2 to 10 units of double-stranded circular DNA molecule. It has 16.5 kilobase length, and the molecular weight is of the order of 10.[7] The mitochondrial genome is highly variable. A segment, known as D-loop, provides high discrimination among

non-related individuals. Corresponding D-loop segments sequences are found in abundance in maternally related individuals. The D-loop segment is amendable to a polymerase chain reaction and, thus, minute quantities of the *mt*DNA can provide mitochondrial DNA profiling for determining maternal interrelationship or identity.

*mt*DNA profiling is coming up as an important tool to establish the identity or non-identity of an individual from hair (shaft), teeth and bones even when they are old. *Mt* DNA has thus widened the identification field tremendously.

In many situations, when nuclear DNA is not available, mitochondrial DNA is used. Many cases where Nuclear DNA was not available, mitochondrial DNA established the identity of the unknown deceased.

21.1.2 Y Chromosomes

Y-chromosomes are found in males. They pass from father to son. They are genetic markers. Their comparison can identify a familial relationship. They help to find familial lineage.

Y chromosomes are used to determine the sex from the body materials. A Y-chromosome-specific probe is used for the purpose.

21.2 IMPORTANCE

The correct identification of criminals/victims/mental patients/heirs/parentage of children and other individuals has always been one of the most important problems in criminal and civil investigations. The best and certain method had been the identification through fingerprints. This fingerprint identification mode was discovered at the fag end of the nineteenth century. It has been helping the criminal justice system tremendously since then; wherever it was adopted. Now, a similar but a more potent and versatile mode, with far wider ramifications, has been found. It has revolutionised the criminal investigation and trials. It is DNA profiling. There are two types of DNA: nuclear DNA (nDNA) and mitochondrial DNA (*mt* DNA). Both are used in the identifications of individuals. However, nuclear DNA is better, with wider applications and specific identifications. The DNA profile[1] of the clue material is compared with that of material from the suspected source to ascertain the identity or non-identity of the common source. If the standard sample s not available from the suspected source, body cells, from his close blood relation(s) can provide the DNA profile for comparison. Further, mitochondrial DNA from hair and bone, where nuclear DNA is not available, can be used for the identification.

The identification *via* DNA profiling is superior to other methods of identification in many respects:

1. It permits the identification of the individual not only from the comparison of his own body materials containing body cells *inter se,* but the identification of his body materials can also be made from the body cells of his blood relations: parents, sons, daughters, brothers, sisters and others.

1. A DNA profile is the intra-structural pattern of the DNA molecule, the disposition of its constituents (base pairs, etc.). It is determined usually by finding corresponding 5 or more of the 13 STRs in the DNA molecule.

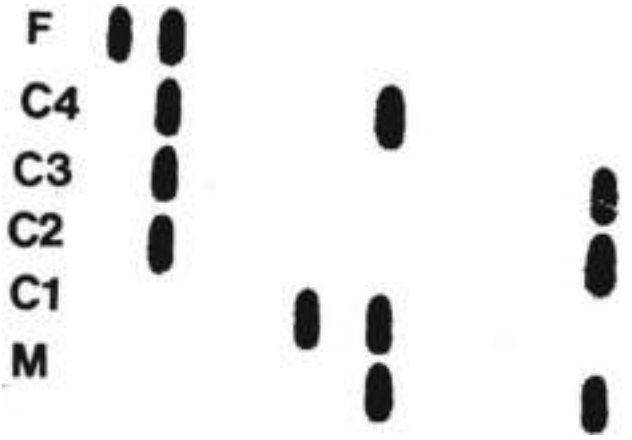


Fig. 21.4

Each of the four children in this family has one band from the mother (M). Likewise children C2, C3 and C4 have one band inherited from father (F). Child C1 has different paternal band, proving C1 had different father

2. The identification is possible from a variety of clue materials, which are available in different types of crimes: blood, semen, hair roots, hair shafts, body tissues, bones. They can definitely be linked to the source (the culprit or the victim) from which they emanated.

   In Naina Sahni's Tandoor Murder case the body of the victim, after the murder, was being burnt in an oven - Tandoor. Foul flesh-burning smell alerted the persons around. They suspected foul play and stopped the burning; a badly burnt body was taken out. The body material was too much charred to permit its use for the DNA test. Bone marrow was used to identify the victim. Its DNA profile was compared to those of her parents and identity established. (CH)

3. Whatever the nature of body material, they have the same DNA profile. The clues can be identified as *inter se*. Thus, a semen stain source is identified positively from a blood sample, a skin piece, a hair root, saliva, etc. taken from the culprit.
4. More importantly, in cases of mutilated non-identified bodies, the identity of the deceased is established by comparing his DNA profile with those from subject's parents, brothers, sisters, sons or daughters.
5. In all countries, thousands of dead bodies remain unidentified. DNA is helping to reduce the number of such unidentified bodies.
6. The quantities of the DNA required for analysis are extremely small, in nanograms and picograms. Polymerase Chain Reaction (PCR) obtains workable quantities through amplification of DNA.

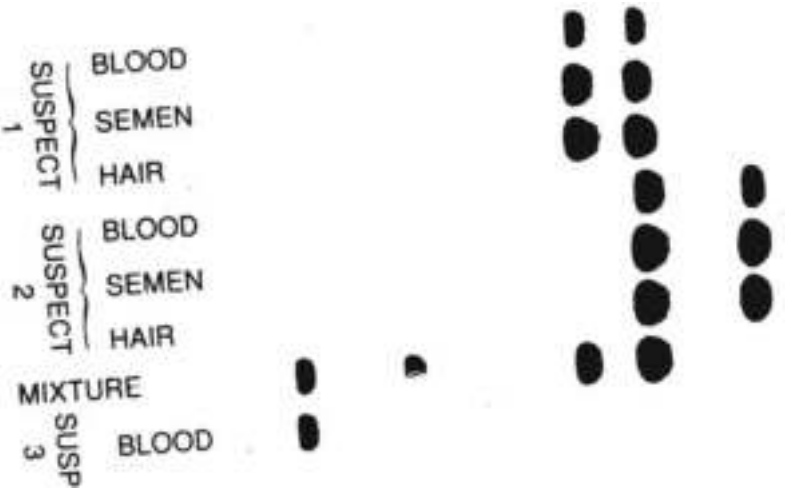


Fig. 21.5

In a case of gang rape, there were three suspects. However analysis of the mixed semen provided identity of only two suspects. Blood, semen and hair provided the same corresponding DNA profiles

7. An important advantage of DNA profiling is that the contamination of the evidentiary clues by similar biomaterial does not prevent the identification. In vaginal swabs, for example, the vaginal fluids are eliminated and they do not inhibit the identification of the source of semen. Likewise, in cases of gang rape, the semen of different rapists in the seminal stains or in the vaginal swabs can be identified as if the semen from other sources were not present.

   In the murder case of a Chief Minister of Punjab, Human Bomb was used. The person carrying the bomb was shattered to pieces. The identity of the person (human bomb) was established through DNA profiles comparison of the person and his parents. (CH)

8. Using Y chromosome specific probes, the sex of person from whom the body material has come is ascertained positively as that of a male. However, female sex has only to be inferred from the absence of male specific chromosomes.

9. DNA profiling is being used successfully in the identification of skeletal remains.

   A fifteen years old girl was murdered. Her skeletal remains were discovered after about eight years. The provisional identity of the deceased was done through skull superimposition technique and comparison of dental data, available with the dentist. Final definite identity was established through DNA profiling.

   A piece of the femur was taken. It was sand blasted to remove contaminants. DNA was extracted and purified from the bone. It was found highly degraded. The DNA, therefore, was typed through PCR amplification of 6 STRs and compared with those of her mother and father. The STRs were consistent inter se. *(CH)*

10. Old cases of disputed paternity, which often come up for inheritance, can be decided correctly through DNA profiling.

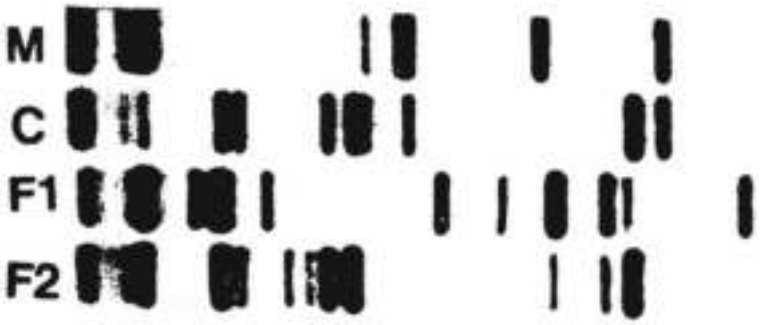


Fig. 21.6

Who is biological father of the child? dna profiles decide that f2 is the father when his 20 rflps matched with those of the child (c). F1 had also some common rflp s but few only. Above are only parts of the dna profiles

In an interesting case, decided in July 2002, by an USA court after 7 years, a 69 year-old person, Ben Erskine, claimed that he was the son of a Yoga Guru, Parmahansa Yogananda. The Guru had died in 1952. The Guru's organisation 'Self-Realisation Fellowship' has vast properties. Ben Erskine wanted a share in the properties. The organisation got a DNA profile of the claimant compared with the DNA profiles of three of the male relatives of the Guru, in India. The independent results from two separate laboratories showed, that there was no relationship between the Guru's clan and that of the claimant, Erskine.

The DNA profiling not only cleared the Guru from the sex scandal stigma, even after 50 years of his death but it also showed that the claimant was an impostor. (CH)

In the recent case of a high profile politician (Tiwari), DNA profiling of the blood of the illegitimate son and that of Tiwari established that the latter was the biological father of the former, though he denied the factum vehemently in the initial stage and accepted fatherhood only after DNA match. (CH)

The method of DNA identification of human beings is inferior to the fingerprint identification as a method only in one respect. The process involves sophisticated tools and techniques. It is, more costly and time-consuming.

The DNA profiling technology has improved tremendously in the past two decades. It has become more time and cost effective.

DNA profiling is, as seen earlier, possible from almost all body materials (Perspiration[2], for example, may or may not contain body cells). They are found in a variety of heinous crimes: murders, dacoities, encounters (fake or otherwise), hit and run cases, assaults, rape and other offences against the person. In addition, body materials are exchanged in many other offences like theft, trespass. The culprit may deposit body materials with the victim, at the scene, en route or on the vehicle used. Likewise, he or his weapon of offences or vehicle may pick up body materials from the victim. Hairs, for example, are shed continuously. The culprit is likely to leave them at the scene. Fallen hairs can provide DNA or *mit*o-DNA for profiling. If the victim has come in contact with the culprit, he is likely to transfer some hairs to the culprit. Thus, they exchange their visiting cards — cards, which cannot be forged or faked; cards, which on processing provide complete and irrefutable identities of their owners. Saliva on the victim, on cigarette stubs, on cups, tumblers, in the spittle can provide materials for DNA profiling. Nasal secretions and abraded skin are other clue materials that can provide DNA profiles.

2. In some cases, sweat may contain body cells. They provide the DNA profile.

There was never a doubt about the individuality of body materials even before the individuality of DNA molecule was discovered. Scientists had not been able to establish experimentally the individuality of materials from a particular source. The body materials were extensively utilised for blood group substances, enzyme and isoenzyme systems. In some cases, the possibility of a particular source of the material could be excluded but the positive identity of the individual source always remained elusive. DNA profiling has changed the scenario. It provides positive linkage with the possible source and equally positive de-linkage in the case of an innocent suspect. A case investigated in the UK, dramatically revealed the factum.

> *The case is known as the Leicester Murders. Two 15 years-old girls were raped and murdered. A seventeen-year-old boy was suspected and arrested. On interrogation (Third Degree?), he confessed to the crime. However, when the DNA profile of the semen from the victim was compared with the DNA profile of the self-confessed rapist-murderer, they were found different. Police let him off.*
>
> *A mass screening program was then organised. The prevalent methods for semen testing were employed first. DNA profiling was employed only in those cases where the usual methods could not eliminate 'a particular subject'. About 5500 were screened before the real culprit could be identified.*
>
> *A DNA profile from the incriminating samples was compared with DNA profiles of a number of samples, obtained from the public. Only one and one sample gave a perfect match. (CH)*

The other major application of DNA profiling is the determination of blood relationship. DNA molecule follows Mendelian law of inheritance. Out of 46 chromosomes, 23 are from the father side and 23 from the mother side. These chromosomes provide the DNA of the issues. The DNA of the offspring is, therefore, a combination of the structures of the DNA of his parents. The parents, brothers, sisters, sons, daughters, even uncles and aunts can be inter-linked. The findings have great importance, both in criminal and civil investigations.

21.3 POSSIBILITIES

DNA profiling has revolutionised the investigation of crime especially in offences against the person. It provides definite evidence of identity or of non-identity of the culprits or victims. Specifically, it helps immensely in the following types of forensic problems in criminal justice system:

1. Linkage of the criminal, the victim, the weapon of offence, vehicle used in the crime, scene of occurrence, routes, *inter se,* through body materials exchanged, dropped or deposited or sites or objectives.

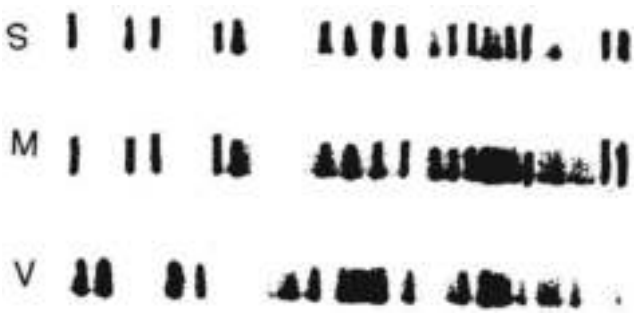


Fig. 21.7

Waterloo of a rapist-kurderer. DNA profile(s) of semen recovered from the pubic hairs of the victim matched with the corresponding dna profile (M) of the murderer's blood. The profile (V) for the victim's blood was completely different

2. Identifications of the culprits or the victim from biological materials
3. It is kingpin evidence in the identification of culprit (or culprits) in gang rape, from semen, semen stains or vaginal swabs in rape cases.
4. Identification of culprit (burglars, robbers, sex maniacs, hand to hand hits, scuffles) through saliva left on cups, glasses, cigarette stubs, spittle, and bitten skin.
5. Identification of persons through urine or faecal matter, left at the wrong places.
6. Identification of mutilated dead bodies through known and available body materials or from the DNA profile of his blood relation
7. Identification and inter-linkages of body parts *inter se* in the cases of scattered or dismembered body parts
8. Establishing correct parentage of a child in disputed paternity cases or adultery cases
9. Ascertaining incest

   A stepfather raped his minor stepdaughter. She conceived and gave birth to a child. The stepfather denied any responsibility. DNA profiles of the blood of the girl, the infant and the stepfather clearly indicated that the stepfather had fathered the child. There were 14 paternal-specific bands visible in the DNA profile of the infant. The entire fourteen bands had corresponding bands in the DNA profile of the stepfather. The expert gave a probability of the stepfather not being the father of the infant as less than one in 1014. (CH)
10. Identification of parents of an aborted foetus, murdered infant or abandoned child,
11. Determination of blood relationship of person(s) claiming the property in inheritance
12. Proof of adultery
13. Determination whether the twins are homozygote or heterozygote

Fig. 21.8

Twin problems? homologous? heterologous? DNA profiling decides.
Identical profiles for identical twins (homologous).
Non-identical profiles for heterologous twins.

14. Verification of false charges relating to rape, fatherhood, etc.
15. In paedophilia cases, DNA profiles developed from semen, saliva or faeces stains link the culprit with the victim/crime.
16. DNA profiles interlink serial rapes and murders or other serial crimes. The linkage provides collective data about the criminal and his *modus operandi.*

    In a case of robbery, DNA profile of the arrested robber was developed and sent to National Database. The Computer search brought in a rich harvest. Four other robbery cases, which had remained unsolved, were identified to be the handiwork of this robber. (CH)
17. In immigration disputes, sometimes illegal attempts is made to induct person of non-permitted relationship by declaring falsely that they are the permitted relatives. DNA identifies blood relation.

    A U.K. based person sponsored to induct brother's family into U.K. He declared that they were his wife and children. DNA profiles eliminated the chance of the children's entry into the country. They were not his biological kids. (CH)
18. Identification of poacher through DNA profiling of the bloodstains of the animal/beast poached on the poacher or on his paraphernalia. It has proved useful to protect wildlife. Bloodstains on poachers link him with the remains of the animal.
19. DNA profiling helps to identify fake encounters.

    On March 22, 2000, terrorists killed 35 Sikhs in a Kashmir village. On March 25, 2000, the security forces killed 5 persons, allegedly foreign terrorists, from across the border. The locals alleged that they were local persons. Blood samples were sent for their identification through DNA profiling. The laboratory found that the blood was unsuitable for the profiling. The blood of the terrorists was sent again to DNA profiling laboratory, along with the blood from the alleged relatives. The DNA profiling established that the terrorists were locals. (CH)

21.4 EVIDENTIARY CLUES

The basic material in DNA profiling is DNA. It is a stable compound. DNA of high molecular weight could be obtained from 5 years old semen stains and 4 years old bloodstains. Low-molecular weight DNA was recovered even from 2400 years old mummies.

Only a small amount, one to ten micrograms of DNA are sufficient for DNA profiling in RFLP technique. This amount is found in about 50 microlitres of blood; or, 10 microlitres of semen. Stains of equivalent amounts are adequate. Likewise, one hair root freshly pulled out, may carry sufficient amount of DNA for profiling.

Usually larger quantities are used for test purposes whenever they are available. For example, about ten hairs are processed if they are available.

The quantities mentioned above are the minimum for normal processing for identification of the individual through RFLP technique, which is on its way out for a number of reasons. Smaller amounts are no longer problematic. **P**olymerase **C**hain **R**eaction (popularly called **PCR**) increases the amount to the desired quantities from nano/picograms of DNA.

DNA is found in the living cell of our bodies and can, therefore, be extracted from different body-materials. A list is given below:

1. Blood and bloodstains
2. Semen and semen stains
3. Saliva, saliva stains
4. Urine, urine stains
5. Bone marrow

6. Canal root pulp
7. Faecal matter
8. Finger nail pairings
9. Body tissues and body organs
10. Foetal material
11. Hair and hair roots
12. Bones
13. Teeth
14. Post-mortem samples
15. Other Body materials/fluids containing body cells

DNA content of common evidentiary clues are given in the table below:

TABLE 1

DNA in Clue Materials

Evidentiary clue	DNA Amount
1. Blood	30 – 50 µg/ml
2. Stain, 1 cm^2	~ 200 – 500 ng
3. Semen	150 – 300 µg/ml
4. Vaginal Swab (after coitus)	0 – 3 ug
5. Plucked hair	1 – 750 ng
6. Shed Hair	0 – 12 ng
7. Saliva (Buccal cells)	~ 15 µg/ml
8. Urine (track cells)	1 to 20 ng/ml
9. Bone	3 – 10 ng/mg
10 Tissues	50 – 500 ng/mg

Notes:

1. The quantity of DNA varies from person to person, with state of health, age and food habit. Liquor, cannabis and drugs affect. The figures given in the table are therefore approximate
2. µ = micro;
3. n = nano
4. Buccal swabs are considered superior as sample for test. They are the least contaminated.

21.4.1 Blood

Blood is the most frequently used test material in DNA identifications. Both liquid blood and bloodstains are used.

21.4.1.1 Liquid Blood from the Scene

The IO collects liquid blood from the crime scene usually. He takes care to:

1. Use sterile (disposable) syringe.
2. Use clean and sterile receptacles.
3. Add EDTA to the collected blood and mix it thoroughly.
4. Transfer blood clots to the tube or to a cloth piece with a spatula
5. Soak a clean cotton cloth piece in blood at the scene, dry it and pack if the above materials are not available.
6. Collect as much water as possible in clean containers immediately to prevent further dilution and degradation, if the blood is in water and to send the collected sample to the laboratory at the earliest. He preserves the sample in a freezer if there has to be delay in sending the sample
7. Blood in water; collect.
8. Collect a control sample of the substrata from a nearby place.

21.4.1.2 Liquid Blood from suspects

A qualified doctor collects liquid blood samples from suspects, using a non-heparinised syringe and needle. Ideally, two samples of 5 ml of blood each are taken. The collected blood is stored in blood collection tubes that contain anti-coagulant EDTA. Such tubes are commercially available. The EDTA and blood are thoroughly mixed. The tubes containing the blood are stored at 4° C. If the blood is to be stored for a long period, it is stored in a freezer.

21.4.2 Bloodstains

Bloodstains are used quite frequently for DNA profiling. Even a small stain can provide a DNA profile. However, it is convenient to work with larger samples. The important factor for successful DNA analysis is that sample is contamination-free in collection and storage of the material. Bloodstains are air-dried at room temperature. The clothes bearing the stain are hanger in clean atmosphere and then stored in moisture-resistant containers. Stains on other substrata are, likewise, dried and sent to departmental laboratory at the earliest. They are packed in paper bags to prevent bacterial growth or disintegration.

21.4.2.1 Wet Bloodstains

Wet stains, on large objects, are picked up (soaked) on a clean cotton cloth and dried. Or, the blood is allowed to dry and then scraped and stored in sterile tubes.

21.4.2.2 Dried Bloodstains

The standard drill to collect dried bloodstains is to:

1. Fix the location of the stains (as in case of other evidence) through photographs or sketches.
2. Collect the object carrying the dry stain itself, whenever possible.
3. Scrape off the bloodstain from the big objects on to a clean paper. Fold the paper in a chemist fold or transfer the material to a sterile sample tube.

4. Collect the sample with a wet (with saline water) clean cotton cloth piece if the stain is small and the object is unwieldy.

   Process the picked up blood further, after drying.
5. Collect a control sample from the place close to the evidentiary clue.
6. Collects dried bloodstains on carpets, upholstery and on wooden objects by cutting the stain bearing area. Pack the stains separately. Also collects a control sample of the substrata from the close by area.
7. Collects blood spatter on adhesive tape by pressing it against the surface and leaving it pressed for some time. Suspend the tape in a container so that it does not meet the sides. He photographs the spatter (with scale) before taping it
8. Collect bloodstains from vehicles (outer surface, under surface) in such a way that other evidence is not mutilated/destroyed. Obtain control samples from the nearby substrata.

21.4.3 Semen

Semen is the second frequent-most material used for DNA analysis. It is the most important evidence in sexual crimes.

21.4.3.1 Azoospermic Semen[3]

Before semen is analysed for DNA profile, it is advisable to ascertain first whether the material is actually semen. Testing semen was almost useless with methods involving RFLP in azoospermic semen. However, the use of PCR/STR technology has changed the scenario. Researchers[4] have reported:

> *The examination of azoospermic semen poses a special problem for the forensic scientist. Both serologic and RFLP methods may result in inconclusive results. PCR analysis is known to have an advantage in the evaluation of variably degraded, small quantities of DNA. This investigation addresses the feasibility of detecting the DNA profiles of azoospermic males in cases of suspected rape by the use of PCR amplification of the VNTR locus DIS 80. DNA profiles were produced from aspermic semen samples from six vasectomized males. Two mixed post-coital vaginal samples containing azoospermic semen from two of the vasectomized males were also obtained and both revealed the combined profiles of the azoospermic semen donors and the vaginal epithelial donors. All cases resulted in an allelic banding pattern of the donor semen matching the respective blood/saliva standard.*

Ideally, a small portion of the stain is checked for the presence of sperms. If sperms are preset, the remaining stain is used for DNA extraction and profiling. If sperms are not found, the PCR technique is used.

21.4.3.2 Vaginal Swabs

In cases of sexual assaults, semen is often recovered on swabs from vagina, anus or from the mouth. The swabs are air-dried and stored under dry conditions.

21.4.3.3 Liquid semen

Liquid samples are collected as liquid blood samples. They are stored at low temperature or are frozen. Repeated freezing and thawing is avoided as it reduces the amount of recoverable DNA.

---

3. Semen without sperms.
4. Skinker DM, Warnecke SC, Morrow JK, Hunsaker JC. 3rd, "DNA typing of azoospermic semen at the D1S80 locus." J Forensic Sci. July 1997; 42(4): 718-20.

Semen samples in rape cases are contaminated with blood or vaginal secretions from the victim. The contaminants are removed by pelleting the sperm heads in a centrifuge. The pelleted DNA gives the DNA profile of the assailant.

As a precautionary measure, blood sample from the victim is taken for better interpretation of the analysis.

21.4.3.4 Proper collection

In the collection of the semen and semen stains the IO takes care to:

1. Collect the liquid semen with a sterile syringe in a sterile sample tube. Despatch the sample to the laboratory at the earliest. Or, store it in a refrigerator till it is sent.
2. Collect the liquid semen on a clean cotton cloth, if the amount of the semen is small.
3. Collect the object bearing the semen, if the object is amenable to the collection. The stain is air-dried before further processing.
4. Collect semen stains on bed, carpet, sofa-set by cutting off the piece of the substrata bearing the stain. Take a control sample of the substrata. Dry them before packing.
5. Collect semen stains from the floor (or from other impervious surface) by scraping or by lifting it on an inert adhesive tape. Take control sample from nearby areas also.
6. Request a doctor to collect the anus or oral swabs from the victim.
7. Request a lady doctor to collects vaginal fluids/swabs from the victim.
8. Use a rape evidence kit to collect the materials.

21.4.4 Hair

Hair samples are pulled from the head of the subject. Live roots material furnishes nucleic DNA in the live roots. Hair shaft provides *mt* DNA. Comb-collected and fallen hairs are also suitable for DNA profiling. Usually shed hairs are found at the crime scene. When there is a scuffle, one may find pulled out hair. The collected hairs are dried before packing.

Different types of hair contain different amount of DNA. In the same person even head hair may well have a different amount of DNA that that from moustache, beard, chest or pubic hair. Some hair may yield plenty of DNA for analysis, others may yield limited amount. PCR techniques however, have overcome the problems of small quantity of the DNA effectively in most of the situations.

Hair is dried before packing/sealing/storage.

Shaft of the hair yield plenty of *mito* DNA analysis.

Collection of hair follows the usual procedure mentioned for collection of hair in the chapter on hair (supra). The IO takes care to:

1. Use clean forceps and containers.
2. Pack only dry hair.
3. Store the hair in a refrigerator in case they are to be analysed for *n*DNA and if there is to be a delay in the dispatch of evidence.

21.4.5 Saliva Stains

Saliva is an important evidentiary clue in many criminal situations. As already seen,[5] saliva, as an evidential clue, often plays a crucial role in many offences against persons. The location/collection/packing are discussed in detail.[6]

Saliva *per se* does not contain body cells, but it does contain sufficient epithelial skin cells from the inside of the cheeks. In fact, saliva, because of these cells, provides about five times more DNA, volume for volume than blood. Saliva is in fact the preferred specimen source for comparison of DNA profiles. The process of taking saliva sample is also non-invasive.

21.4.6 Body Tissues and Organs

Body tissues, bone pieces, and certain organs often form important clue material. They are left/scattered at the scene, in the vehicles, with the weapon of offence, on the person of the culprit (in blast cases), at the sites of dismemberment or disposal. They are also important clues in dismembered/mutilated bodies. They can link the crime, the criminal, the victim, the scene, and the weapon of offence. They are located, collected, preserved, and dispatched in the same way as other biological evidence.

Common precautions relevant to all biological evidentiary clues, against contamination, putrefaction and degradation are observed with vehemence as their DNA analyses/comparisons provide definite/irrefutable linkage of the crime, the culprit and the victim *inter se*.

21.4.7 Post-mortem Samples

The post-mortem body materials, such as blood samples, spleen, flesh muscles, skin, bones, bone marrow, nails, hair all have been used for profiling, as they are good sources of DNA.

21.4.8 Foetal Material

Foetal material is a source of DNA. It helps to solve many crimes, including illegal abortions, undesired/illegitimate/rape conceptions, etc. Its DNA profile is compared with the suspected sources and the source of the foetus identified.

The collected foetal material is processed at the earliest to obtain a DNA profile. It could be preserved only by freezing it. These materials provide satisfactory DNA profiles to prove/disprove paternity.

21.4.9 Blood Samples in Paternity Cases

In disputed paternity cases, DNA profiles from the blood samples of the child and that of the parents are compared. In civil cases, usually, clients' family doctor takes blood samples if that is acceptable to both the parties (litigants). In some cases, the doctor is designated by the court. In criminal cases, the investigating officer collects blood samples through government doctor. The doctors collect the blood samples observing all the legal formalities and precautions against contaminations and spoilage. Blood sampling kits have come up. They are commercially available and are used.

The name and address of the doctor and the date and time of the taking blood sample is recorded.

For proper identifications, two passport size photographs of each concerned person are used. One copy of the photo, duly endorsed by the doctor, is pasted on the wrapper. The second copy is kept in the case record file. The completed identification documents are sent to the designated laboratory along with the blood samples.

5. See chapter 20 for a detailed discussion.
6. *Ibid.*

TABLE 2

Main Evidentiary Clues for DNA

S. no	Source	site	Evidentiary clue
1	victim	Vagina inside/outside	Semen, blood, Hair
2	Bite marks	Skin, clothing victim/ culprit	Saliva
3	Discarded Tissue paper	Surface area	Blood, semen. Mucus, sweat
4	Discarded used condom	Inside/outside surface	Semen, Vaginal fluid, blood, rectal material/cells
5	Finger nail of victim/ culprit	Nail crevices	Skin tissues, blood, vaginal fluids
6	Dirty Laundry	Surface area	Blood, semen, sweat
7	Head gear (cap, turban) mask	inner surface	Sweat, hair, dandruff
8	Smoked cigarettes	Cigarette stubs	Saliva
9	Ligature for strangling	Surface of ligature	Blood, skin, sweat
10	Bedding	Bed sheet, pillow blanket surface	Sweat, hair, semen, urine, saliva
11	Discarded used toothpick	Tip	Saliva
12	Tumblers, cup, bottles	Mouth touching site	Saliva
13	Stamps/envelopes	Licked area	saliva

21.5 EVALUATIONS

DNA profiling is needed in criminal and civil investigations. It gives definite identification. The tools and techniques are comparatively new and costly. However, all those who are concerned with the identifications, insist upon its use. Even the courts now insist upon the production of DNA evidence where it is required but not presented.

21.5.1 RFLP Analysis

RFLP Analysis is theoretically simple. When DNA is subjected to the action of single Restriction Enzyme, a large number of fragments (RFs) are created. These fragments are subjected to electrophoresis where they get separated into bands, depending upon their sizes and the residual charges thereon. Usually, the electrophoresis process conditions are so controlled that only fragments of 2-10 kilobase or other desired size are left on the Agarose gel. These fragments are picked up on a Nylon Membrane. This process is called Southern Blotting. Hybridisation probes are used to identify the fragments. These probes are pieces of DNA molecule, made radioactive with radioactive phosphorus isotopes (usually ^{32}P).

Hybridisation processing links the radioactive probes with the DNA fragments on the Nylon Membrane. The complementary base pairing takes place and the fragment becomes radioactive. The Nylon Membrane, after removing the excess of probes, is brought in contact with an X-ray film, which is affected at the radioactive sites to give visible bands on the X-ray plate on development. Comparison of the bands from the questioned DNA sample with the DNA profile from the suspected sources reveals the identity/non-identity of the given questioned source.

The following probability calculations for the number of common bands (indicating corresponding RFLPs) in paternity cases have been given:

Table 3

The Chance Occurrence of Band Matching

Number of bands	Odds against a chance match
4	250 to 1
6	4000 to 2
8	65000 to 1
10	1 million to 1
12	17 million to 1
14	268 million to 1
16	4300 million to 1
18	68000 million to 1
20	1 million million to 1

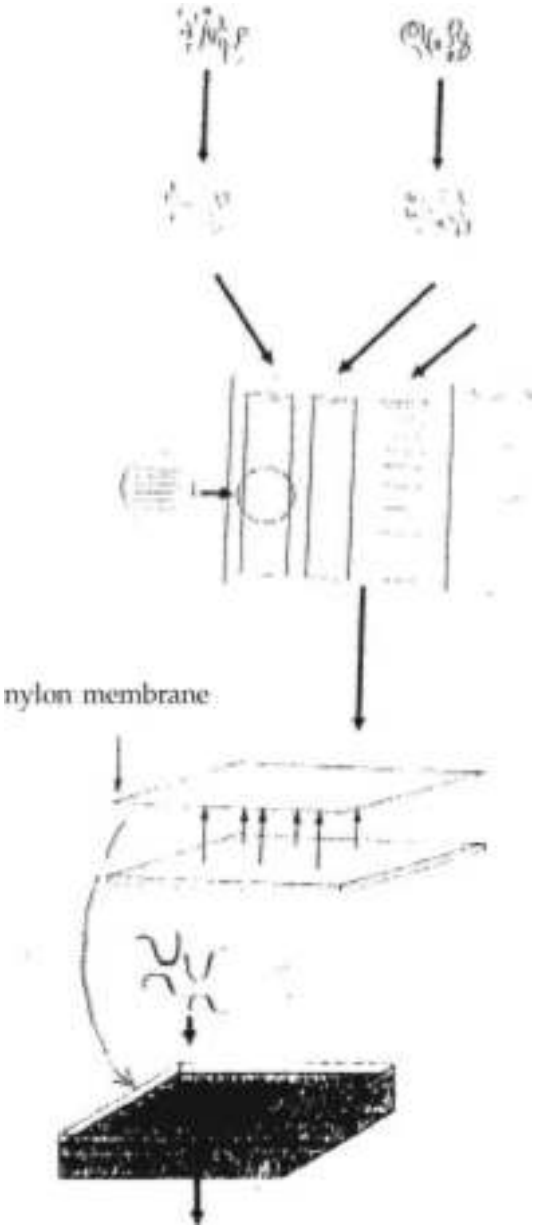
Fig. 21.9

Blood from the scene and from seven suspects dna profiled.
only two profiles match, which ones?

RFLP analysis of DNA involves the following steps:

1. Isolation of high molecular weight DNA from biological material
2. Fragmentation of DNA molecule through Restriction Enzymes (RE)
3. Separation of the Restriction Fragment Lengths (RFLs) through electrophoresis

4. Transference of RFLs to Nylon Membrane (Southern Blotting)
5. Preparation of radioactive probes
6. Hybridisation of the RFLs through radioactive probes
7. Visualisation of RFLs bands on X-ray film through autoradiography and its development to give visible patterns of the Restriction Fragment Length Polymorphs (RFLPs).



DNA is extracted from specimens

DNA is digested with restriction enzymes to produce fragments

Standard DNA size markers

large

Double stranded DNA fragments are separated by electrophoresis through an agarose gel

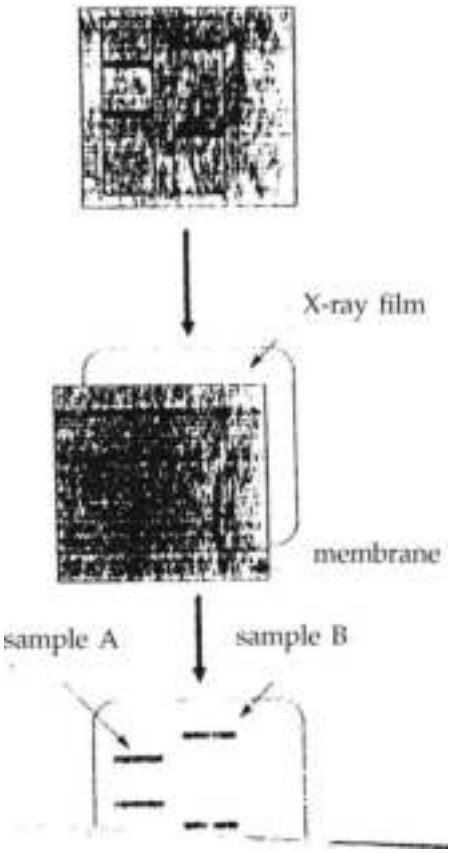
small

denture to produce single stranded DNA fragments

transfer of DNA fragments from gel to nylon membrane

radioactively labelled DNA probe in single stranded form

cover membrane with probe and incubate



the DNA probe binds to specific complementary DNA fragments but positions on membrane are invisible

wash membrane to remove excess probe

place X-ray film next to the membrane to detect banding pattern

develop X-ray film to visualise DNA Typing pattern.

Fig. 20.10

Schematic outline

RFLP Analysis was the first process used to identify human beings. The technique was laborious, time-consuming and costly. It also needed more quantity of samples, which was not available in some cases. It is more or less abandoned now.

The following facts have facilitated the acceptance of the evidence:

1. The RFLPs, which form the basis of identification, are:
   - Inherited
   - Stable throughout the lifetime of a person, like the ridge patterns of a fingerprint
   - Inherited from parents and have true genetic character.
2. There is adequate empirical data on the frequencies of various RFLPs to base identification on a statistical basis.
3. A nomenclature for RFLPs, based on molecular weights, has come up. In fact, the separation as well as identification of RFLPs is based mainly on their weight.
4. Forensic Science Laboratories and other institutions carrying out DNA profiling have needed expertise and tools and techniques for correct profiling.

5. The results are verifiable and can be crosschecked.
6. Appropriate test procedures, controls and standards have been laid down.
7. The quantum of proof: number, quality and positional variation data are specified.
8. Quality assurance is being practised in some DNA profiling laboratories.
9. Sensitivities of the test procedures have been improving with the passage of time. The amount of DNA required was 1 to 10 microgram. This quantity stands reduced to nanogram and picogram.
10. **P**olymerase **C**hain **R**eaction (PCR) replicates DNA fragments. It has ultimately overcome the deficiency of the sample's sufficiency.

21.5.2 STR Analysis

21.5.2.1 Definition

A Short Tandem Repeat (**STR**) is a microsatellite, consisting of a unit of two to thirteen nucleotides repeated hundreds of times in a row on the DNA strand. STRs surround the chromosomal centromere (the structural centre of the chromosomes). They are classified according to the length of the core repeat units, the number of contiguous repeat units, and/or the overall length of the repeat region. STR analysis has become indispensable in Forensics to discriminate/identify a common source of two or more biological evidentiary clue samples. STR analysis employs probes,[7] which get attached to the desired STRs. Polymerase Chain Reaction (PCR) amplifies the STR.

STRs are popular DNA markers because:

1. STRs have a high power of discrimination.
2. PCR amplify the various STRs many times, to get the desired amount.
3. Various STRs are multiplied to the same extent in the PCR.
4. The number of the STRs varies tremendously among persons *inter se*. It helps discrimination/individualization of the persons
5. The STRs of smaller sizes are chosen because they are easily separated, survive degradation of the sample and permit better statistical evaluation.
6. STRs have lower mutation rates, which gives predictable and stable data.

The above characteristics of STRs have made the STRs indispensable for human identification of all types.

21.5.2.2 Nature

There are 13 Short Tandem Repeat (STR) is a DNA molecule. They are analysed and compared to establish DNA profiles. They differ from person to person, except for identical twins that have similar DNA profiles.

The STRs are separated by electrophoresis. They are visualised with silver staining, which gives dark bands pattern. The patterns are characteristic for individuals.

Multiplication of STRs involves the following steps:

1. The desired strands are denatured and treated with primers and enzymes.
2. They are hybridised to get copies of the strands through PCR.

7. DNA markers, in a biological sample, are nucleotides that bind to DNA probes.

3. The polymerization takes place automatically. The desired fragments increase exponentially It is controlled to get the desired quantity of the STR. The operations are now automatic; performed through instruments. The process is so efficient that adequate quantity of the fragments is obtained in about two hours.

The DNA profiling is now done through PCR based STRs of repeat sequences of the high polymorphic region. This method uses highly polymorphic regions that have short repeated sequences of DNA (the most common is 4 bases repeated, but there are other lengths in use, including 3 and 5 bases). They are treated with sequence-specific primers and amplified. The fragments are then separated through electrophoresis. Two electrophoresis techniques: capillary and gel electrophoresis are commonly used. Capillary technique is more popular.

Other individuals share the STRs used also. Typically, each STR allele will be shared by around 5 – 20% of individuals. The power of STR analysis comes from looking at multiple STR loci simultaneously. The pattern of alleles can identify an individual quite accurately. Therefore, a number of STRs are located and compared simultaneously. The combined probabilities of the STRs give individuality of the DNA profile. Usually, 5 STRs are required for identifications. The probabilities generated this way are $\mathbf{1x10^{18}}$ or more. There are about 12 million monozygotic twins on earth; the theoretical probability is not accurate.

USA uses 13 STRs for identity in its CODIS (**C**ombined **D**NA **I**dentification **S**ystem) database; while UK uses 11 STRs in its NDNAD (**N**ational **DNA D**atabase) for identification of the individuals.

21.5.3 Polymerase Chain Reaction (PCR)

PCR is virtually a cloning process in which DNA or its fragments are replicated any number of times — even a million or more times. Equipment is now commercially available for automatic polymerase chain reactions.

The PCR technique has revolutionised the DNA analysis. Its advent has proved a boon for personal identification in forensics. It is used in both VNTR[8] and STR techniques. PCR is the modern approach for DNA analysis. It is used by most of the institutions carrying out DNA profiling work.

More recently, quantitative PCR estimation, through quantity based varying fluorescence intensities, has improved the PCR result interpretation.

21.5.3.1 Advantage PCR

The PCR amplifications offer many advantages:

1. PCR needs very small amounts of nascent evidentiary clues, considered insufficient previously, can be analysed for DNA. For example, a single hair, saliva on cigarette stubs or fine spray drop of blood can be used to provide the DNA profile of the individual. The possibility of DNA profiling with smaller amounts is a distinct advantage over RFLP technique.
2. PCR amplification is carried out in multiplex mode. In other words, a number of PCR of different STRs amplifications can be carried out simultaneously.
3. PCR amplification is possible with degraded DNA. This extends the application of DNA analysis to many cases in which the traditional method would fail.

8. **VNTR** is **V**ariable **N**umber **T**andem **R**epeat. It is a location in a genome where a short nucleotide sequence is found as a tandem repeat. These are found on many chromosomes. They show variations in length (number of repeats) among individuals.

4. PCR increases the amount of relevant DNA fragments (STRs). The increased amount increases the speed and thus, reduces the processing time and ensures better quality results of analysis.
5. PCR requires small amounts. The some quantities of the original clue material can be spared for independent testing by the defence, or repeat test at more than one place.
6. PCR produces increased amount of the disputed material. Thus related tests can be performed with the additional material.

These advantages of PCR technology have made the RFLPs techniques for DNA Profiling more or less redundant.

21.5.3.2 PCR Process

The Polymerase Chain Reaction process involves the following steps:

1. DNA is incubated at a suitable high temperature (~ 95° C). The double strand of DNA changes into a single strand. The strand acts as a template for replication.
2. The temperature is lowered. Oligonucleotides, re-application primers are added. They get attached (bound) to their complementary sequences on the template DNA strands in a specific way.
3. Nucleotide primers added stepwise, extend the primers strands and new DNA molecules are formed in the presence of DNA polymerase.
4. The thermo-stable polymerase TAQ is used for the purpose. It is heat stable. The DNA molecules have double strands. The molecules so formed acts as templates for subsequent replication cycles and the formation of new molecules increases exponentially.
5. In an automated reaction chain, the steps and the number of cycles are controlled by thermo-cycler. The extension steps are now carried out with greater speed at higher temperatures (up to 75° C) by the new generation of the thermo-stable polymerase.

An enzyme is used to make many copies of a small section of the DNA. This section cut into pieces by another enzyme and separated by electrophoresis. The fragments are then visualised with a silver stain, with the pattern of light and dark bands seen being characteristic for an individual.

21.5.3.3 Controlling Factors

The general representative factors, which control the quality, quantity and the speed of the replication of DNA or parts thereof, are:

1. The quality and quantity of the following materials:
   - DNA material
   - Oligonucleotide Primers
   - Polymerase
2. Ingredients of the reaction mix for the range 1 – 5000 copies are:

TABLE 5

1.	Primers	0.05 – 0.5 mM
2.	TAQ	1 – 4 units/100 ml.
3.	Buffer	5 – 8.4 pH
4.	Protein BEA/Gelatin	0 – 50 ml/ml
5.	KCl	50 mM
6.	Mg	1 – 6 mg
7.	d NTP	50 – 200 uM.

3. The reaction conditions:
   - The periodicity of the thermo-cycler
   - The frequency of the addition of the reaction mix
   - The number of cycles.

In principle each cycle, double the amount. Thus, the number of copies increases rapidly.

TABLE 6

PCR Replication

S. No	Number of Cycles	Number of copies
1	10	1024
2	20	10^6
3	30	10^8 (*i.e.*, up to maximum)

4. The presence, absence, addition or extraction of promoters or inhibitors
5. When the PCR product reaches about 10^{10}, the replication reaches its limit.

The main aim of the process is to achieve specificity of the reproduction of the DNA or of the target sequence(s). The following steps help to achieve this:

1. Starting material of very high purity is used because extremely small samples of DNA are involved sometimes. Contamination is scrupulously avoided when identifying, collecting, and preserving DNA evidence.

   In a case of forced oral sex, a single hair was found sticking in the mouth of the victim. Mitochondrial DNA analysis provided very strong evidence to get the culprit convicted. (CH)

The following precautions are essential:

- Wear gloves. Change them often.
- Use disposable instruments or clean them thoroughly before and after handling each sample.
- Avoid touching the area where you believe DNA may exist.
- Avoid talking, sneezing, and coughing over evidence.
- Avoid touching your face, nose, and mouth when collecting/packaging evidence.
- Air-dry evidence thoroughly before packaging.
- Put evidence into new paper bags or envelopes, not into plastic bags.
- Do not use staples.

2. Strict control of the reaction conditions is maintained.
3. High quality and the right quantity of the oligonucleotide primers is used .
4. Length of the target sequence is controlled. Shorter the target sequence, better the specificity.
5. The primers length is dependent upon the STRs.
6. Annealing temperature 60 – 65° C is used.
7. The number of cycles depends upon the number of copies of the material to be replicated. Less than fifty copies will hardly produce detectable material.
8. The minimal amount of the clue material, which should be available for amplification, is about 0.1 ng of amplifiable DNA. This amount contains about 40 total templates. This is the smallest amount recommended for each case.

21.5.3.4 Problems in PCR

The main problems in PCR amplification are:

1. Amplification inhibition

   It is due to problems with the starting DNA material. It is overcome by:

   - Reducing templates
   - Increasing polymerase
   - Changing reaction condition

2. Mis-incorporation

   The oligonucleotides get attached at wrong places. It has been estimated that this happens 1 or 2 times in 10^4 incorporations. The mis-incorporations are consequently negligible, unless, the starting material is too small.

3. Reliability of PCR products; the replication process is not perfect because:

   - Polymerase is not perfect; mis-incorporations do occur.
   - Sequence insertion or deletion may take place due to alignment errors in the template.
   - Tandem repeat sequences can cause misalignment on the template. Thus PCR products of different sizes are formed.
   - When the sample is small, the number of the template is small. Here in some cases some alleles amplify preferentially. The other alleles are masked and not seen.

Other problems, which need attention to get the correct results, are:

1. The sample has to be pure, contamination free.

   In an interesting case, sterile swabs were supplied in a rape examination kit. Wherever these swabs were used for DNA amplification they gave one same DNA profile. It was found that the swabs were contaminated by the same DNA material. (CH)

2. The sample should be authentic.

   It was an ingenious case of DNA fraud. A doctor in Canada raped his sedated patient(s), leaving semen on her underwear. She reported the case to the police which took a blood sample from the doctor. The DNA profiles of the semen and blood did not match. The process was repeated three times. Every time the profiles did not match. Yet the victim was

sure that the doctor has raped her. Fourth time three samples (buccal swab, hair and blood) were taken. The DNA profiles from buccal swab and hair matched with the semen profile but not with the blood profile. It was found that the doctor had surgically planted a Penrose drain filled with foreign blood. Every time the blood was being taken doctor guided the needle to the drain and thus fake sample of blood for DNA profile was given as sample. (CH)

3. DNA sample should not be degraded.
4. The Analyst should be aware of the existence of monozygotes (there are about 12 million of them in the world!), Chimeras [9], synthetic DNA, etc.
5. New workers may be over zealous and give results on insufficient data.
6. Some pseudo scientists follow conformation syndrome. They give wrong findings at times.
7. The system may fail at a time. Periodic check (calibration) of the system is essential.

It has, however, been seen that given the right conditions, undesirable side reactions are negligible.

21.5.4 Identification Techniques

There are three types of techniques for the identification of individuals in PCR amplification:

1. DNA Sequencing
2. Sequence Variations
3. Length Variations

21.5.4.1 DNA Sequencing:

DNA sequencing has become extremely important, in fact the most important tool for:

1. Individualisation of human beings
2. Understanding hereditary diseases and other problems
3. Clinical treatment and diagnosis of refractory diseases, and
4. Most importantly, for the evaluation of the genetic code

Mind boggling progress has been made in all aspects of DNA technology in recent years and the progress is continuing at an astounding rate. The major developments are coming in:

- Initial processing of DNA evidence
- Electrophoresis materials (gels) and experimental conditions
- Automation in separation of RFLs, determination of their molecular weight, use of fluorescent labels for their detection and evaluation

Today automatic processes are used for DNA sequencing. Thousands of nucleotides can be sequenced in a day. Automation has reduced human error to the minimum. However, considerable emphasis is being given on reproducible and reliable results. It is ensured by repeating the analysis, especially in criminal cases, where the lives/liberties of persons are concerned. Multiple sampling is adopted in important cases.

9. **Chimera**, in genetics, an organism or tissue that contains at least two different sets of DNA, most often originating from the fusion of as many different zygotes (fertilized eggs).

21.5.4.2 Sequence Variations:

Sequence variations are studied through **S**equence **S**pecific **O**ligonucleotides **(SSO)** which are of 15 to 30 Oligonucleotides corresponding to the target allele. The labelled probe is mixed with the PCR products on a dot-blot format. It will hybridise with the corresponding allele, not with others. A number of probes of different types are used in the same way. In one system the PCR products is fixed on a membrane in a dot-blot form. In another way the probes are fixed on the membrane in the form of blot and labelled PCR products are brought in contact. Corresponding allele gets attached. The attached positions are identified through the labels in both the techniques. The former is known as *dot-blot technique* and the latter as *reverse dot-blot technique*. The latter technique has proved its worth and is being used extensively.

> *In a rape case there were two suspects. The samples of the two suspects, of the victim (blood, epithelial cells and swab sperms) and blank were collected and analysed by reverse dot-blot technique. The test patterns were different for the two suspects and the victim identified the first suspect and eliminated the second. The sperm DNA from the vagina corresponded only with DNA of the first suspect. (CH)*

Other methods of DNA profiling through PCR amplification are:

- Direct sequence – A promising method
- Allele specific amplification – more useful in medicines
- Oligonucleotide – Ligation Assay
- Variations at restriction site – a useful technique
- Denaturing gradients Gel Electrophoresis

These methods are not extensively used in forensic work yet. The details of the methods are beyond the scope of the book.

21.5.4.3 Length Variation

The restriction fragment length polymorphism RFLP analysis of loci containing **V**ariable **N**umbers of **T**andem **R**epeats (VNTR) has been extensively used in identifying persons. Corresponding technique in PCR is *PCR–VNTR and PCR_STR* techniques. In the former the VNTR used are sufficiently large (15–70 bp.) In the latter, the STR is short, usually of 4 bases pairs and also of 3 or 5 base pairs. They allow separation of allele product by simple gel or capillary electrophoresis.

The PCR–VNTR technique uses automated DNA sequence, coupled to the fluorescence detection system. The fluorescent labels are introduced into the PCR primers. More than one fluorescent label can be used simultaneously.

21.5.5 Y-chromosome Analysis

The research has been extended to male specific chromosomes the **Y-chromosome**. Primes have come up which target Y-chromosomes and can thus separate Y-STRs. They are inherited paternally and thus can link an individual to his paternal male relatives.

Y-chromosome analysis helps to identify the sex of the biological sample. It is based upon the fact that the males alone have Y-chromosomes in addition to X-chromosomes. The females have X–chromosomes only. Primers have been discovered which target only polymorphic region of Y-chromosomes. A number of X and Y chromosome specific probes have been identified. They are used for discrimination.

Y-chromosome analysis permits direct identification of the male source of the clue material. The female source the clue material is inferred from the absence of Y-chromosome.

21.5.6 Amplified Fragment Length Polymorphism (Amp FLPs)

In **Amp FLPs** technique Variable Number Tandem Repeat polymorphism is utilized to identify different alleles. Separated on a polyacrylamide gel, the alleles are visualised by spraying the reagent. The technique has not been used extensively.

21.6 DNA PROFILE RECORDS

The importance of the DNA profile records has been fully realised in most of the well-off countries. They are using it in the following situations:

- **Recidivism**; the culprit leaves biological clues at the scene/with the victim. Similar DNA of clues from the record indicates recidivism.
- **Serial murder/rapes**; the culprit exchanges biological clues (especially blood semen) in such cases Their DNA interlink the crimes if his DNA profile(s) exists on the record.

Identity of Culprit; if we have DNA profile computerised indexed records of the known criminals, the criminal in a new case, is identified from the record. The DNA profile of the offender is developed from the specimen clue materials, which he leaves at the scene or with the victim.

Two well-known DNA profiles records (data bank or database) and indices are in USA and UK. They are being updated continuously. They have over five million profiles each on their systems. In the USA the system is called **Combined DNA Index System** (**CODIS**). In UK it is called **National DNA Database** (**NDNAD**).

21.6.1 Combined DNA Index System — CODIS

CODIS (Combined DNA Index System), an electronic database of DNA profiles that can identify suspects, are similar to the AFIS (Automated Fingerprint Identification System) database. It is maintaining the DNA index of individuals convicted of certain crimes, such as rape, murder, and child abuse. Upon conviction and sample analysis, perpetrators' DNA profiles are entered into the DNA database. DNA profiles from a crime scene can be entered into CODIS. Thus, an investigating officer will be able to know an 'unknown' criminal through the CODIS. In this system 13 STRs are utilized for the comparison and identification of DNA profiles.

21.6.2 National DNA Database (NDNAD)

The UK DNA database works on the same principles. The system however uses only 11 STRs for storage, comparison and identification of the profiles.

When a match is made from a National DNA Databank to link a criminal, with a prior DNA profile record in the National Data bank, involved in a fresh crime scene or case, the linkage is often called a *cold hit*. A cold hit is of immense help to the police in their investigation.

21.7 CASE STUDIES

21.7.1 Maternity Identification

A boy from Ghana, born in the UK, wanted to join his mother, brother and two sisters in UK. The authorities denied him entry because they were not satisfied that he was the son of the alleged mother. The usual blood tests were carried out. They indicated that the probability, of mother-son non-relationship was too meagre, less than 0.01%. However, they could not categorically fix mother-son relationship. She could be his aunt as well!

The case was referred to Prof. Jeffrey and his colleagues. They carried out DNA profiling of the blood of the mother and son and his brothers and sisters. Although the father was not available, most of his DNA fingerprints could be reconstructed from most of the DNA fragments, present in at least one of the 3 undisputed siblings, but absent from the mother. Of the 39 paternal fragments so identified, approximately half were present in the DNA fingerprints of the boy. Since unrelated individuals do not share DNA fragments, the examination of DNA profile suggested very strongly that the boy had the same father as the brother and two sisters.

But the main question was still unanswered. What was the relationship of the boy to the woman? Removing the paternal-specific fragments from the boy's DNA fingerprints, there remained 40 fragments in the boy's profile, all of which were present in the woman's DNA profile. This was strong evidence that the boy was the woman's son.

To cross-check their findings, the researchers examined the probability of their findings being still proved wrong. They found that of the 40 maternal-specific fragments in the boy, 25 were specifically inherited from the mother. All these 25 fragments were present in the woman.

The researchers argued that the probability of two unrelated people sharing 1 fragment is 0.26. So, the probability of being unrelated and yet sharing them all is, one in 20 thousand billion. Now, it was clear that the woman and the boy were so closely related, as to be mother and son.

Jeffreys and his colleagues also looked into the probability of the woman being the boy's aunt. They calculated that the probability of the siblings sharing a single DNA fragment is 0.62. Thus, the probability that the woman is in fact the boy's aunt, yet shares all 25 of the maternal fragments is 0.6225, i.e., *1 in 50,000 billion.*

It was, therefore, concluded, beyond any reasonable doubt, that the boy was indeed the woman's son. This evidence was conveyed to the immigration authorities, which dropped the case against the boy and allowed him to stay with his mother in Britain. (CH)

21.7.2 Abandoned Baby

This is a strange case where DNA profiling of a baby, found abandoned in a car, was connected to the owner of the car. There were, however, some facts, which cast doubts on the son-mother relationship of the abandoned baby and the lady owning the car. They are—

1. *The lady denied she gave any birth to the child or to any other child.*
2. *The medical doctor certified that the lady had not been pregnant recently.*
3. *The lady delivered a child just after eight months from the discovery of the child.*

The scientists performing the DNA profiling test were sure that son-mother relationship was correct. The residual samples were submitted to other scientists. They confirmed the findings.

There was no criminal case against the alleged mother as the doctor found that the child was stillborn. (CH)

21.7.3 DNA Analysis v Confession

It is a case of mass screening for a killer-rapist

On November 21, 1983, Lynda, a girl of 15 years was found murdered. The body was discovered a day after the killing. She had been raped and strangled with her own scarf. Police employed over 100 investigators and interrogated everybody in the locality, but the killer was not discovered. They had taken swabs from the vagina of the deceased and collected semen stains from her person and garments. The murderer continued untracked.

On July 31, 1986, another 15 years old girl Dawn disappeared. She was found raped and strangled to death in a nearby field. The nature of the injuries on the persons of Lynda and Dawn were similar. The police caught a seventeen-year-old boy who confessed to the crime. The police requested the services of Professor Jeffreys. He obtained the DNA profiles from the semen recovered from the two victims Lynda (in 1983) and Dawn (in 1986) and compared them with DNA pattern from the suspect. He found that whereas the semen from Lynda and Dawn were from the same source, they did not tally with the DNA pattern of the suspect. On their evidence, the suspect who had even confessed to the crime was let off.

The investigating police officer believed that the culprit belonged to the same area and that he should be between 15 and 30 years of age. He, therefore, decided that the eligible population of the area should be mass screened for the possible source of the semen.

The mass screening was started. Ninety per cent of the persons could be eliminated straightway, by conventional blood tests. The remaining ten percent persons were subjected to DNA profiling. Thus, about 5500 persons had been screened at a cost of about Rs. 1.5 crores, yet the killer still eluded them. Only 250 men who had left the area since the occurrence remained for screening.

Then, a sudden breakthrough occurred. A person bragged, in a pub, that he had personated for his friend in the mass screening for the killer. Police at once took up their cue, interrogated the imposter and reached the culprit, Colin Pitchfork, a 27 years old baker. The rest was easy. His blood test including DNA profile indicated that he was the rapist and murderer of the two girls, Lynda and Dawn. He was sentenced to two terms of life imprisonment for the crimes. (CH)

21.7.4 DNA Profile v Eyewitness

That DNA profiling is better than eyewitness accounts even, was proved beyond doubt in a rape case, which took place in New York. A rapist sexually assaulted three women. The police caught hold of one Victor Lopez. He was a light coloured person of Hispanic origin. However, all three victims insisted that a black person attacked them. The attorney for the culprit pleaded that it was a case of mistaken identity as his client was not black as alleged by the victims of rape. The jury, however, took the DNA profile as evidence and found Lopez guilty. (CH)

21.7.5 DNA Profile Induces Confession

The driver of a bus raped a 57 years old woman suffering from Alzheimer in the bus she was travelling. The woman when interrogated could not remember who had attacked her. However, police investigations revealed that only the bus staff could have committed rape. The driver of the bus became the prime suspect. His blood DNA profile matched with the DNA profile of the semen recovered from the victim. When the driver was confronted with the evidence, he confessed to the crime without much verbal persuasion. (CH)

21.7.6 DNA Fraud: Fake Blood Sample

It was an ingenious case of DNA fraud. A doctor in Canada raped his sedated patient(s), leaving semen on her underwear. She reported the case to the police, which took the blood sample from the doctor. The DNA profiles of the semen and blood did not match. The process was repeated three times. Every time the profiles did not match. Yet the victim was sure that the doctor has raped her. Fourth time three samples (buccal swab, hair and blood) were taken. The DNA profiles from buccal swab and hair matched with the semen profile but not with the blood profile. It was found that the doctor had surgically planted a Penrose drain filled with foreign blood. Every time the blood was being taken doctor guided the needle to the drain and thus fake sample of blood for DNA profile was given as sample.(CH)

21.8 SETTING STANDARDS

DNA profiling is a powerful tool for identification in forensics. Therefore, there is a need for DNA experts to fix clear guidelines for the procedures and standards needed to ensure reliable DNA profiling. They may also fix the quantum of data for identifications. Legislators may also consider whether licensing and proficiency testing should be required in DNA forensics for quality assurance, quality control and standardisation of tools and techniques to the viable extent.

21.9 ADDITIONAL READINGS

1 Bukleton, *et al. Forensic DNA Evidence Interpretation.* CRC Press.

21.10 CASE LAW

(Supreme Court Cases (21st Century))

21.10.1 Nirbhaya (Jyoti Singh) Rape-murder[10]

Author's Summary

It is the most heinous crime in the Indian sex-crime history. A paramedic student, along with her friend boarded a bus in Delhi at about 12 o'clock at night. There were six men in the bus. Soon the six men attacked the pair. They bet her friend and incapacitated him. They beat the female brutally and all raped her in turn and then threw her from the bus in half-dead half naked condition, along with her friend. The wailing of the friend brought in help. They took them to hospital, where the best medical treatment could not save her. The six culprits were arrested and tried. Four were sentence to death, one committed suicide and one was juvenile, and punished according to law.

The judgment of the Supreme Court is a landmark judgment and should be read in its entirety. The extracts here relate to DNA evidence, the clinching evidence against all the accused.

Highlights italicised

Extract from Judgment (Verbatim)

83. **DNA Analysis**: In order to establish a clear link between the accused persons and the incident at hand, the prosecution has also adduced scientific evidence in the form of DNA analysis. For the purpose of DNA profiling, various samples were taken from the person of the prosecutrix; the complainant; the accused, their clothes/articles; the dumping spot; the iron rods; the ashes of burnt clothes; as well as from the offending bus.

PW-45 Dr. B.K. Mohapatra analysed the said DNA profiles and submitted his report thereof. In his report, he concluded that the samples were authentic and capable of establishing the identities of the persons concerned beyond reasonable doubt.

Prosecution relies upon the biological examination of various articles including the samples collected from the accused and the DNA profiles generated from the bloodstained clothes of the accused. The DNA profile generated from the samples collected, when compared with the DNA profile generated from the blood samples of the victim and PW-1 Awninder Pratab Pandey, were found consistent.

84. For easy reference and for completion of narration of events, I choose to refer to the articles recovered from the accused pursuant to their disclosure statements and other articles like bloodstained clothes; samples of personal fluids like blood, saliva with control swab; other samples like nail clippings, penile swab, stray hair etc. Details of the DNA analysis is contained in the reports of biological examination and DNA profiling (Ex.PW-45/A to Ex.PW-45/C), furnished by PW-45 Dr. B.K. Mohapatra.

85. Before considering the above findings of DNA analysis contained in tabular form, let me first refer to what is DNA, the infallibility of identification by DNA profiling and its accuracy with certainty. DNA – De- oxy-ribonucleic acid, which is found in the chromosomes of the cells of living beings, is the blueprint of an individual. DNA is the genetic blue print

10. *Mukesh v State for Nct of Delhi*, Criminal Appeal Nos. 607–08 of 2017, SC, Decided on 5 May 2017. Bench: Dipak Misra, R Banumathi, and Ashok Bhushan.
Also see another land mark judgment on another brutal rape-murder case: *Shankar Kisanrao Khade v State of Maharashtra,* (2013) 5 SCC 546.

for life and is virtually contained in every cell. No two persons, except identical twins have ever had identical DNA. DNA profiling is an extremely accurate way to compare a suspect's DNA with crime scene specimens, victim's DNA on the bloodstained clothes of the accused or other articles recovered, DNA testing can make a virtually positive identification when the two samples match. A DNA fingerprint is identical for every part of the body, whether it is the blood, saliva, brain, kidney or foot on any part of the body. It cannot be changed; it will be identical no matter what is done to a body. Even relatively minute quantities of blood, saliva or semen at a crime scene or on clothes can yield sufficient material for analysis. The Experts opine that the identification is almost hundred per cent precise. Using this i.e. chemical structure of genetic information by generating DNA profile of the individual, identification of an individual is done like in the traditional method of identifying fingerprints of offenders. Fingerprints are only on the fingers and at times may be altered.

Burning or cutting a finger can change the mark of the fingerprint. But DNA cannot be changed for an individual no matter whatever happens to a body.

86. We may usefully refer to Advanced Law Lexicon, 3rd Edition Reprint 2009 by P. Ramanatha Aiyar which explains DNA as under:-

DNA.- De-oxy-ribonucleic acid, the nucleoprotein of chromosomes. The double-helix structure in cell nuclei that carries the genetic information of most living organisms.

The material in a cell that makes up the genes and controls the cell. (Biological Term) DNA finger printing. A method of identification especially for evidentiary purposes by analyzing and comparing the DNA from tissue samples. (Merriam Webster)" In the same Law Lexicon, the learned author refers to DNA identification as under:

DNA identification. A method of comparing a person's deoxyribonucleic acid (DNA) – a patterned chemical structure of genetic information – with the DNA in a biological specimen (such as blood, tissue, or hair) to determine if the person is the source of the specimen. – Also termed DNA fingerprinting; genetic fingerprinting (Black, 7th Edition, 1999)

87. DNA evidence is now a predominant forensic technique for identifying criminals when biological tissues are left at the scene of crime or for identifying the source of blood found on any articles or clothes etc. recovered from the accused or from witnesses. DNA testing on samples such as saliva, skin, blood, hair or semen not only helps to convict the accused but also serves to exonerate. The sophisticated technology of DNA fingerprinting makes it possible to obtain conclusive results. Section 53A Cr.P.C. is added by the Code of Criminal Procedure (Amendment) Act, 2005. It provides for a detailed medical examination of accused for an offence of rape or attempt to commit rape by the registered medical practitioners employed in a hospital run by the Government or by a local authority or in the absence of such a practitioner within the radius of 16 km from the place where the offence has been committed by any other registered medical practitioner.

88. Observing that DNA is scientifically accurate and exact science and that the trial court was not justified in rejecting DNA report, in *Santosh Kumar Singh v State* through CBI (2010) 9 SCC 747, the Court held as under:-

65. We now come to the circumstance with regard to the comparison of the semen stains with the blood taken from the appellant. The trial court had found against the prosecution on this aspect. In this connection, we must emphasise that the court cannot substitute its own opinion for that of an expert, more particularly in a science such as DNA profiling which is a recent development.

66. Dr. Lalji Singh in his examination-in-chief deposed that he had been involved with the DNA technology ever since the year 1974 and he had returned to India from the UK in 1987 and joined CCMB, Hyderabad and had developed indigenous methods and techniques for DNA fingerprinting which were now being used in this country. We also see that the expertise and experience of Dr. Lalji Singh in his field has been recognised by this Court in *Kamalanantha v State of T.N.* (2005) 5 SCC 194 We further notice that CW

1 Dr. G.V. Rao was a scientist of equal repute and he had in fact conducted the tests under the supervision of Dr. Lalji Singh. It was not even disputed before us during the course of arguments that these two scientists were persons of eminence and that the laboratory in question was also held in the highest esteem in India.

67. The statements of Dr. Lalji Singh and Dr. G.V. Rao reveal that the samples had been tested as per the procedure developed by the laboratory, that the samples were sufficient for the purposes of comparison and that there was no possibility of the samples having been contaminated or tampered with. The two scientists gave very comprehensive statements supported by documents that DNA of the semen stains on the swabs and slides and the underwear of the deceased and the blood samples of the appellant was from a single source and that source was the appellant.

68. It is significant that not a single question was put to PW Dr. Lalji Singh as to the accuracy of the methodology or the procedure followed for DNA profiling. The trial court has referred to a large number of textbooks and has given adverse findings on the accuracy of the tests carried out in the present case. We are unable to accept these conclusions as the court has substituted its own opinion ignoring the complexity of the issue on a highly technical subject, more particularly as the questions raised by the court had not been put to the expert witnesses. In *Bhagwan Das v State of Rajasthan,* AIR 1957 SC 589 it has been held that it would be a dangerous doctrine to lay down that the report of an expert witness could be brushed aside by making reference to some text on that subject without such text being put to the expert.

71. We feel that the trial court was not justified in rejecting the DNA report, as nothing adverse could be pointed out against the two experts who had submitted it. We must, therefore, accept the DNA report as being scientifically accurate and exact science as held by this Court in *Kamti Devi v Poshi Ram,* (2001) 5 SCC 311. In arriving at its conclusions the trial court was also influenced by the fact that the semen swabs and slides and the blood samples of the appellant had not been kept in proper custody and had been tampered with, as already indicated above. We are of the opinion that the trial court was in error on this score. We, accordingly, endorse the conclusions of the High Court on Circumstance 9." [emphasis added].

89. From the evidence of PW-45 and the details given in the above tabular form, it is seen that the DNA profile generated from bloodstained clothes of the accused namely, A-1 Ram Singh (dead); A-2 Mukesh; A-3 Akshay; A-4 Vinay; and A-5 Pawan Gupta @ Kalu are found consistent with the DNA profile of the prosecutrix. Also as noted above, two sets of DNA profile were generated from the black colour sweater of the accused Pawan. One set of DNA profile found to be female in origin, consistent with the DNA profile of the prosecutrix; other set found to be male in origin, consistent with the DNA profile of PW-1. Likewise, two sets of DNA profile were generated from the black colour sports jacket of accused Vinay, one of which matched the DNA profile of the prosecutrix and another one matched the DNA profile of PW-1. Likewise, two sets of DNA profile were generated from the jeans pant of accused Akshay, one of which matched the DNA profile of the prosecutrix and another one matched the DNA profile of PW-1. The result of DNA analysis and that of the DNA profile generated from bloodstained clothes of the accused found consistent with that of the victim is a strong piece of evidence incriminating the accused in the offence.

90. DNA profile generated from the blood samples of accused Ram Singh matched with the DNA profile generated from the rectal swab of the victim. Blood as well as human spermatozoa was detected in the underwear of the accused Ram Singh (dead) and DNA profile generated therefrom was found to be female in origin, consistent with that of the victim. Likewise, the DNA profile generated from the breast swab of the victim was found consistent with the DNA profile of the accused Akshay.

91. As discussed earlier, identification by DNA genetic fingerprint is almost hundred percent precise and accurate. The DNA profile generated from the bloodstained clothes of the accused and other articles are found consistent with the DNA profile of the victim and DNA profile of PW-1; this is a strong piece of evidence against the accused. In his evidence, PW-45 Dr. B.K. Mohapatra has

stated that once DNA profile is generated and found consistent with another DNA profile, the accuracy is hundred percent and we find no reason to doubt his evidence. As pointed out by the Courts below, the counsel for the defence did not raise any substantive ground to rebut the findings of DNA analysis and the findings through the examination of PW-45. The DNA report and the findings thereon, being scientifically accurate clearly establish the link involving the accused persons in the incident.

227. After establishing the identities of each of the accused persons, the informant and the prosecutrix through DNA analysis, the DNA profiles generated from the remaining samples, where the identity of biological material found thereon needed to be ascertained, were matched with the DNA profiles of the prosecutrix, the informant and the accused, generated earlier from known samples. Such an analysis cogently linked each of the accused with the victims as also with the crime scene. A summary of the findings in the report submitted by PW-45, Dr. B.K. Mohapatra, is as under:

"S.No.	Accused	DNA EVIDENCE
1	Ram Singh	Rectal swab from the prosecutrix contained DNA of male origin, which was found consistent with the DNA developed from the blood sample of this accused.
		DNA profile developed from the blood stains from the underwear, T-shirt and slippers of this accused was found consistent with the DNA of the prosecutrix.
2	Mukesh	DNA profile developed from the blood stains from the pants, T-shirt and jacket of this accused was found consistent with the DNA of the prosecutrix.
3	Akshay	Breast swab of the prosecutrix contained DNA of male origin which was found consistent with the DNA of this accused.
		DNA profile developed from the blood stains from the jeans of this accused was found consistent with the DNA of the prosecutrix.
4	Vinay	DNA profile developed from the blood stains from the underwear, jacket and slippers of this accused was found consistent with the DNA of the prosecutrix.
5	Pawan	DNA profile developed from the blood stains from the sweater and shoes and slippers of this accused was found consistent with the DNA of the prosecutrix."

228. Further, a summary of the DNA analysis of the biological samples lifted from the material objects such as the bus, the iron rods, and the ash and unburnt pieces of clothes is also worth producing here:

"Serial No.	Identity of the victim	Findings of DNA Analysis
	Informant	The DNA profile developed from burnt clothes pieces was found to be of male origin and was consistent with the DNA profile of complainant.
		The bunch of DNA profile developed from hair and blood stained pieces of paper recovered from the bus was found consistent with the DNA profile of complainant.
		The DNA profile developed from blood stained dried leaves collected from the place where both the victims were thrown matched with the DNA profile of complainant.

"Serial No.	Identity of the victim	Findings of DNA Analysis
	Prosecutrix	The DNA profile developed from blood stains from both the iron rods recovered at the instance of accused Ram Singh from the bus was of female origin and was consistent with the DNA profile of prosecutrix.
		The DNA profile developed from blood stains from curtains of the bus matched with the DNA profile of prosecutrix.
		The DNA profile developed from blood stains from seat covers was found consistent with the DNA profile of prosecutrix.
		DNA profile developed from blood stains from the bunch of the hair recovered from floor of the bus below sixth row seat, blood stains prepared from the roof of the bus near back gate, blood stains prepared from the floor of the bus near back gate, blood stains taken from side of back stairs of the bus, and blood stains taken from the inner side of the back door of the bus was found consistent with the DNA profile of prosecutrix.

21.10.2 DNA Fixes Rape-Rapist-Murderer[11]

Author's Summary

This is an unfortunate case where the culprit, a misguided youth, misusing the power/pelf of his father (a senior police officer), committed brutal rape-cum murder of a young lady when she did not succumb to his overtures. There were no eyewitnesses. Forensics un-ravelled the crime. DNA analysis provided the clinching evidence, supported by medical examination. It is unfortunate that the Supreme Court found it right to reduce the sentence in such a brutal heinous murder in extremely aggravating circumstances.

Highlights italicised

Relevant Extracts (verbatim)

As per the prosecution story, the appellant harassed and intimidated the deceased and despite her requests and then her remonstrations, did not desist from doing so. The deceased thereupon made several complaints against the appellant in different Police Stations during the year 1995 on which he was summoned to the Police Station and was advised to behave properly and a Personal Security Officer, Head Constable Rajinder Singh PW-32, was also deputed for the security of the deceased. It appears that as a consequence of the complaints against him, the appellant too retaliated and made a report to the University on 30th October, 1995 alleging that the deceased was pursuing two courses simultaneously which was in violation of the University Rules and when no action was taken he sent two reminders dated 4th December, 1995 and 20th December, 1995 to the University as well. A show cause notice was issued to the deceased and in response thereto she submitted her reply dated 1st December, 1995 and during the pendency of these proceedings, the result of her LL.B. 5th Semester examination was withheld. On 23rd January, 1996 PW Head Constable Rajinder Singh, the PSO, did not turn up at the residence of the deceased at the stipulated time on which she left for the university in her car along with her parents PW-1 Mr. C.L. Mattoo and PW-44 Mrs. Rageshwari Mattoo who had

11. *Santosh Kumar Singh v State Through CBI*, 2011 AIR SCW 3647 : (2010) 9 SCC 747.

to visit the Tis Hazari Courts to attend to some civil proceedings. The parents were dropped off at Tis Hazari at 10.15 a.m. Head Constable Rajinder Singh, however, reached the Faculty of Law directly and saw the appellant present there. The deceased attended the class from 11.15 a.m. to noon and thereafter accompanied by the Head Constable left the faculty for Tis Hazari but finding that her parents had already left the court, she returned to her residence at about 1.45 p.m. and directed Head Constable Rajinder Singh to report again at 5.30 p.m. The deceased then had her lunch whereafter Virender Prasad, the domestic help, left the house at about 2.30 p.m. to meet his friend Vishnu Prasad @ Bishamber at the residence of PW-6 Lt. Col S.K. Dhar at Safdarjung Enclave and returned to Vasant Kunj at 4.55 p.m. He then took the dog for a walk in the colony. The appellant came to the residence of the deceased at about 4.50 p.m. carrying his helmet in his hand and was seen by PW-2 Kuppuswami. PW-3 Jaideep Singh Ahluwalia, Security Supervisor in the colony also saw the appellant at 5.30 p.m. near the residence of the deceased, PW-43 and O.P. Singh Advocate also noticed the appellant riding out of the park area of B-10, Vasant Kunj at the same time. Head Constable Rajinder Singh PW reached the residence of the deceased at about 5.30 p.m., as directed, along with Constable Dev Kumar. The Head Constable pressed the call bell but eliciting no response from inside, he went to another door which opened onto the courtyard and knocked but again to no effect. As the door was slightly ajar the two entered the bedroom of the deceased and found her dead body lying under the double bed. The Head Constable immediately informed Police Station, Vasant Kunj about the incident on which SHO Inspector Surinder Sharma arrived at the site and a daily diary report (*rojnamcha*) to the above facts Ex. PW-18/A was also recorded at 5.45 p.m. Inspector Lalit Mohan, Additional SHO, Vasant Kunj was entrusted with the investigation on which he along with Sub-Inspector Sushil Kumar, Sub-Inspector Padam Singh, Head Constable Satish Chand and several other police officers too reached the residence of the deceased and found her dead body lying under the double bed with the cord of the electric heat convector tied around her neck. He also noticed blood stains around the body. A case under section 302 of the IPC was thereafter registered at Police Station, Vasant Kunj, on the complaint of the father of the deceased, in which the day's happenings were spelt out. It was further noted that after completing their work in the Tis Hazari Courts he and his wife had visited Safdarjung Enclave and from there he had gone on to attend an official meeting at Vikas Kuteer, ITO whereas his wife had visited the All India Institute of Medical Sciences and it was on returning to his residence at 7.30 p.m. that he found that his daughter had been murdered.

> ***The dead body was also subjected to a post-mortem on 25th January, 1995 at the Safdarjung Hospital by a Board of Doctors consisting of Dr. Chander Kant, Dr. Arvind Thergaonkar and PW-33 Dr. A.K Sharma who in their report Ex. PW 33/B found 19 injuries on the dead body and also observed that the private parts showed black, curly non-matted pubic hair, the hymen intact with no tearing present and admitting only one finger. The Doctors also took two vaginal swabs and slides were duly sealed, the swabs and slides in a glass bottle as well as samples of the blood and hair. The clothes of the deceased were also taken into possession and sealed. The Board also opined that the death was a result of strangulation by ligature and that the injuries on the dead body were sufficient to cause death in the ordinary course of nature.***

Inspector Lalit Mohan thereupon produced the appellant before PW-50 DSP Shri A.K. Ohri of the CBI and the subsequent investigation was made by the DSP with the assistance of several other officers from the CBI. The underwear of the appellant was also seized by the CBI as he represented that he had been wearing the same underwear for the last couple of days. DSP Ohri also visited the crime scene on the 26th January, 1996 but did not find Mr. C.L. Mattoo, the father of the deceased, present. On the next day, he recorded the statement of Virender Parshad, the domestic servant and also directed Shri D.P. Singh, DSP to conduct the house search of the appellant. On the 28th January, 1996, a request Ex. PW 34/A was made by Mr. S.K. Bhatnagar, Additional Director of the CBI to Dr. A.K. Gupta, Medical Superintendent, Dr. R.M.L. Hospital for procuring the blood samples of the appellant. DSP

Ohri along with the other staff took the appellant to the hospital and met PW-34 Dr. N.S. Kalra, Head of the Biochemistry Department and two blood samples of 10 ml. each were taken by Ms. Godavari Mangai, Lab Assistant and were handed over to Dr. Kalra. These samples as well as the other case property collected by DSP Ohri or entrusted to him by Inspector Lalit Mohan were deposited with the Moharrir Malkhana on the 29th January, 1996 and preparations were made to refer the matter for a DNA test. Specimen hand writings Ex.PW24/A1 to A21 of the appellant were also obtained once again this time by the CBI. On 30th January, 1996 Shri M.L. Sharma, Joint Director, CBI addressed a letter to the Director, CCMB, Hyderabad requesting for DNA profiling. Several articles were accordingly entrusted to PW-39 Sub-Inspector R.S. Shekhawat on 31st January, 1996, they being:

1. One sealed parcel containing clothes of the deceased such as T-shirt, brassiere, jeans and underwear;
2. One sealed packet containing underwear of the accused Santosh Kumar Singh;
3. One sealed jar containing vaginal swabs/vaginal slides of the deceased; and
4. The blood samples of the appellant taken in the Dr. R.M.L. Hospital.

The Sub-Inspector thereafter flew to Hyderabad on 31st January, 1996 and deposited the aforementioned articles in the Office of Dr. Lalji Singh, Officer on special duty at the CCMB, Hyderabad on the next morning and an acknowledgement Ex. PW-49/A relating to the following articles was obtained:

1. One sealed parcel containing clothes supposed to be of the deceased, namely, T-shirt, brassiere, jeans and underwear.
2. Vaginal swabs/vaginal slides supposed to be of the deceased.
3. One thermocole box containing 4 vials marked as S-l, S-2, S-3 and S-4 supposed to be blood of the accused.

The underwear of the appellant was, however, returned by Dr. Lalji Singh as it was not relevant for the DNA fingerprinting test.

* * *

In the course of a rather verbose judgment, the trial court noted that there were 13 circumstances against the appellant. We quote herein below from the judgment:

1. *The accused had been continuously harassing the deceased right from the end of 1994 to January 1996, a few days before her death.*
2. *The accused had more than once given an undertaking that the accused would not harass the deceased in future while admitting that the accused had been doing so earlier.*
3. *The motive of the accused was to have the deceased or to break her.*
4. *On the day of occurrence, the accused was seen in the premises of Faculty of Law, University of Delhi in the forenoon, where the deceased had gone to attend LL.B. class, while the accused was no more a student of Faculty of Law at that time.*
5. *At the crucial time before murder, i.e., about 5 p.m. on 23-1-1996, the accused was seen outside the door of the flat of the deceased, i.e., B-10/7098 with helmet in his hand which had a visor.*
6. *On the day of occurrence after murder, the accused had reached late to attend class at Indian Law Institute, Bhagwan Dass Road, where the accused was a student too.*
7. *Immediately after the murder, the mother of the deceased had raised suspicion that the accused had a hand in the murder of her daughter.*
8. *When the accused joined investigation on the night between 23/24-1-1996, the accused had an injury on his right hand. There was swelling and fracture on 5th*

metacarpal of right hand. There was no plaster or bandage on his hand. That injury was fresh, having been caused 24 to 38 hours. The blood pressure of the accused at that time was high which showed anxiety.

9. *DNA Fingerprinting Test conclusively establishes the guilt of the accused.*
10. *On 25-1-1996, the helmet Ex. P.3 of the accused which was taken into possession had broken visor. On 23-1-1996 before the murder, it was found by PW-2 Shri Kuppuswami, PW Personal Security Officer Rajinder Singh that the helmet of the accused had a visor. Violence was detected on both sides of visor. Helmet was besmeared with a spree of blood. At the spot, pieces of visor were found near the body of the deceased besmeared with her blood.*
11. *The deceased had 19 injuries on her person besides three broken ribs. These injuries were suggestive of force used for rape. A tear mark over the area of the left breast region on the T-shirt of the deceased suggested that the force was used for molestation.*
12. *The accused took a false defence that fracture on the hand of the accused was sustained by the accused on 14-1-96 and it was not a fresh injury. The accused also gave false replies against proved facts.*
13. *The influence of the father of the accused resulting in deliberate spoiling of the case.*

The trial court then went on to circumstance No. 9 and evolved its own theories and after a huge discussion, rejected the DNA report given by the CCMB, Hyderabad as also the evidence of Dr. Lalji Singh and Dr. G.V. Rao.

This finding has also been reversed by the High Court by observing that though there appeared to be no physical evidence of rape on the body but the DNA test conducted on the vaginal swabs and slides and the underwear of the deceased and the blood sample of the appellant, it was clear that rape had been committed, and that too by him. The High Court held that it would be a dangerous doctrine for the court to discard the evidence of an expert witness by referring to certain texts and books without putting those texts to the expert and taking his opinion thereon. The High Court also reversed the finding of the trial court that the vaginal swabs and slides and the blood samples of the appellant had been tampered with. The trial court and the High Court both held circumstance No. 11 in favour of the prosecution and it was observed that the deceased was alone at the time of incident and that she had been brutally attacked with the helmet which had been used with great force to cause as many as 19 injuries, including three broken ribs.

17. Mr. Sushil Kumar has then argued with emphasis, that the case rested primarily on the factum of rape and if it was found that there was no evidence of rape, the case of murder would also fall through. He has, accordingly, taken us to circumstance No. 9, which the trial court noted as under:

DNA fingerprinting test conclusively established the guilt of the accused.

He has first pointed out that the post-mortem did not reveal any evidence of rape. Reference has been made to the statement of PW-33 Dr. A.K. Sharma, who along with a Board of two other Doctors had performed the post-mortem on the dead body on the 25th January, 1996 at the Safdarjung Hospital and it was observed that the deceased was wearing a full sleeved high neck pinkish T-shirt with a small tear on the breast, blue coloured jeans, one brassiere and underwear and woollen socks and though there were a large number of injuries on the dead body and the local examination of the private parts showed black, curly non matted pubic hair, and an intact hymen, with no tearing. The Doctor was also questioned as to whether the hymen would always be torn and ruptured during the first sexual encounter and he explained that though this would be the normal case but it was not always so and that the hymen could remain un-ruptured even after repeated sexual intercourse for certain reasons which he then spelt out. It has, accordingly, been submitted that there was absolutely no evidence of rape detected during the course of the examination. He has also pointed out that as there were no semen stains on the dead body of the deceased or her clothes and as the underwear of the appellant sent to the CCMB, Hyderabad had been returned without examination and had been examined thereafter

in the Central Forensic Science Laboratory, Delhi and the semen's stains found were of group A which was not the blood group of the appellant, there were no evidence suggesting rape.

18. It has, finally, been submitted that the observation of the High Court that the DNA test conclusively proved the involvement of the appellant in the rape was not tenable as it appeared that the vaginal swabs and slides which were allegedly taken from the dead body at the time of the post-mortem examination and the blood samples of the appellant taken under the supervision of PW Dr. N.S. Kalra had been tampered with. It has been argued that as per the findings of the trial court the record of the Malkhana with respect to the vaginal swabs and slides had been fudged and though these items had been handed over to the CBI officers on the 25 January 1996 they had been deposited in the Malkhana on the 29 January 1996 and no explanation was forthcoming as to how and why this delay had happened, it has also been submitted that as per the evidence of Dr. N.S. Kalra a request had been made to him by the CBI to take 2 samples of blood of 10 ml. each from the appellant but 2 samples of 10 ml. had been taken and transferred to 4 vials and when the vials had been opened at the CCMB, only 12 ml. of blood had been found, and this too cast a doubt on the prosecution case. It has finally been submitted that the tests conducted by the CCMB, Hyderabad were faulty and could not be relied upon.

19. The learned Additional Solicitor-General has, however, controverted the above submissions and has pleaded that they were based on the supposition of a bias against the appellant and that all those involved including the officials of the CBI, the Doctors who had conducted the post-mortem examination, those who had taken the blood samples and the Scientists of the CCMB were in league to implicate him in a false case. He has further argued that there was no evidence of tampering with the vaginal swabs and slides which had been sealed by the Doctors and handed over to the police and had been collected from the Malkhana by PW-39 Inspector Shekhawat and taken to the CCMB, whereas the blood samples, on the contrary, had been retained in the office of Dr. N.S. Kalra in the RML Hospital and that Inspector Shekhawat had taken them from there and gone straight on to Hyderabad and delivered them to the CCMB with seals intact.

It is the primary submission of Mr. Sushil Kumar that the vaginal swabs and slides taken from the dead body at the time of the post-mortem examination had been tampered with and as there was some suspicion with regard to the blood samples taken by Dr. N.S. Kalra on the 25 January, the DNA report too could not be relied upon. This is a rather far-fetched plea as it would mean that not only the investigating agency, that is the senior officers of the CBI and DSP Ohri in particular, the doctors who had taken the vaginal swabs and slides, the doctors and other staff who had drawn the blood samples, and the scientists in Hyderabad had all been in a conspiracy to harm the appellant. To our mind, this premise is unacceptable. We see from the post-mortem report Ex. PW 33/B dated 25 January 1996 and the endorsement thereon that one bundle containing a full sleeved high neck pinkish violet colour T-shirt having a cut mark over the area of the left breast region, one blue coloured jeans, one pair of woollen socks, one white coloured brassiere and one blue coloured underwear had been sealed and handed over to the investigating officer, Inspector Lalit Mohan. It also finds mention that these items along with two vaginal swabs and two slides had also been handed over to the I.O. It has been submitted by Mr. Sushil Kumar that these items had been retained by Inspector Lalit Mohan till the 25th of January, 1996 and then handed over to PW-38 Inspector Sunit Kumar of the CBI. Inspector Sunit Kumar, however, deposed that on the 29 January 1996, and on the direction of DSP Ohri, he had gone to the Department of Forensic Medicine, Safdarjung Hospital, and taken the bundle of clothes and one jar containing vaginal swabs and slides duly sealed and several other items as well and that a specimen of the seal had also been obtained by him. It is, therefore, obvious that till 29th of January, 1996 the aforesaid articles remained in the custody of the Safdarjung Hospital and that they were deposited in the malkhana on the 29 January 1996.

* * *

There ***are extremely aggravating circumstances as well. In particular, we notice the tendency of parents to be over indulgent to their progeny often resulting in the most horrendous of situations. These situations are exacerbated when an accused belongs to a category with unlimited power or pelf or even more dangerously, a volatile and heady cocktail of the two. The reality that such a class does exist is for all to see and is evidenced by regular and alarming incidents such as the present one. Nevertheless, to our mind, the balance sheet tilts marginally in favour of the appellant, and the ends of justice would be met if the sentence awarded to him is commuted from death to life imprisonment under section 302 of the Indian Penal Code; the other part of the sentence being retained as it is. With this modification in the sentence, the appeal is dismissed.***

21.10.3 DNA Connects Mohamad Ajmal Kasab, Terrorist with Terror[12]

Author's Summary

Ajmal Amir Kasab was a terrorist, who along with other terrorists from Pakistan committed terrorist activity in Mumbai killing many persons and destroyed property in 2008. All other terrorists were killed except Kasab during encounter. His association with the terrorist group was established through DNA, extracted from the beddings of the group.

Relevant Extracts (verbatim)

The appellant, Mohammed Ajmal Mohammad Amir Kasab @ Abu Mujahid (hereinafter referred to as 'the appellant' or as 'Kasab'), who is a Pakistani National, has earned for himself five death penalties and an equal number of life terms in prison for committing multiple crimes of a horrendous kind in this country. Some of the major charges against him were: conspiracy to wage war against the Government of India; collecting arms with the intention of waging war against the Government of India; abetting the waging of war against the Government of India; commission of terrorist acts; criminal conspiracy to commit murder; criminal conspiracy, common intention and abetment to commit murder; committing murder of a number of persons; attempt to murder with common intention; criminal conspiracy and abetment; abduction for murder; robbery/dacoity with an attempt to cause death or grievous hurt; and causing explosions punishable under the Explosive Substance Act, 1908. He was found guilty of all these charges besides many others and was awarded the death sentence on five counts, life-sentence on five other counts, as well as a number of relatively lighter sentences of imprisonment for the other offences.

* * *

The DNA Connect:

345. *It is seen above that among the articles recovered from Kuber were a number of blankets, shawls and many other items of clothing. The stains of sweat, saliva and other bodily secretions on those articles were subjected to DNA profiling and, excepting Imran Babar (deceased accused No. 2), Abdul Rahman Baba (deceased accused No. 5), Fahadullah (deceased accused No. 7) and Shoaib (deceased accused No. 9), the rest of the six accused were connected with various articles found and recovered from the Kuber.* ***The appellant's DNA matched the DNA profile from a sweat stain detected on one of the jackets (see report Ext. No. 205-F).*** *A chart showing the matching of the DNA of the different accused with DNA profiles from stains on different articles found and recovered from the Kuber is annexed at the end of the judgment as Schedule No. III.*

12. *Mohammed Ajmal Mohammad Amir Kasab @ Abu Mujahid v State of Maharashtra*, AIR 2012 SC 3565 : 2012 AIR SCW 4942 : (2012) 9 SCC 1.

21.10.4 DNA Fixes Foetus' Father-Murderer[13]

Author's Summary

A girl from Delhi was inveigled by a rapist for repeated sex on the promise of marrying her. She got pregnant. The rapist wanted her to abort, which she resisted. He ultimately took her in his mother's car, on the pretext of marrying her at Haridwar, to a secluded place and tried to kill her by beating with jack and pana, cut her with blades and throwing acid on her person. Police. passing by, hearing the shrieks, reached the spot; caught hold of the culprits. There were no eyewitness. However, she was alive when the police reached the scene. She could give the details of the brutalities she suffered. Thereafter she died. The DNA connect of the culprit with the foetus in the womb of the victim, clinched the case against the culprit.

Highlights italicised

Relevant Extracts (verbatim)

Shorn of unnecessary facts, the case of the prosecution as projected before the trial court was that on 17-11-2004 Inspector D.N. Verma (PW-1) along with Sub-Inspector Chander Pal Singh (PW-2), Constable Rambir Singh, Constable Sukhram, Constable Ashok Kumar and Driver Yashvir Singh were on patrolling duty; that when they reached ahead of Badsu on Khatoli Road leading towards Falut, they met Constable Rajesh Kumar and another Constable Ramavtar who informed PW-1 and other persons accompanying him that one Indica car took a turn for going towards Falut road and that they heard some screaming noise from that vehicle. PW-1, accompanied by the other personnel referred to above, proceeded towards Falut road and after a distance saw an Indica car. They stated to have seen through the focus light of the police jeep two young men trying to pull out a girl in an injured condition by opening the rear door of the car. It is stated that it was around 21.30 hours. The police jeep in which PW-1 and others were proceeding stopped ahead of the Indica car and caught hold of the two young men and also noticed a girl, with injuries all over, on whom acid was also sprinkled. The girl had also sustained injuries on the head as well as on her right cheek. On noticing the above, according to PW-1, when he questioned her, she responded by stating that her name was Jyoti and she is the daughter of one Baljeet Singh, R/o Lane No. 16, House No. 56, Jagatpuri, P.S. Preet Vihar, New Delhi and that her mother's name was Varsha whose cell number was 9871020368. Inspector D.N. Verma (PW-1) stated to have gathered information from her that she developed a friendship with the appellant Sandeep while she was working in a mobile shop. She also stated to have revealed that she was pregnant. According to the information gathered from Jyoti, accused Sandeep had called her on that evening and asked her to come to Laxmi Nagar Market, Delhi, around 6 p.m. promising her that he will marry her at Haridwar. Believing his words, she went to Laxmi Nagar Market from where she was taken in a car and that while they were moving in the vehicle, accused Sandeep asked Jyoti to get the foetus aborted at Meerut, to which she disagreed. On this, he started beating her inside the vehicle right from the point of Modi Nagar. She stated to have further informed PW-1 and others that she told accused Sandeep that she would reveal all facts to his family members as well as to the police and that when the vehicle in which they were travelling turned towards an isolated place near Khatoli, they tried to throw her into the sugarcane field at which point of time PW-1 and other police members

13. *Sandeep v State of Uttar Pradesh*, (2012) 6 SCC 107 (with other criminal appeals). [Judgment : Fakkir Mohamed Ibrahim Kalifulla, J.].

reached the spot. According to her information to PW-1, accused Sandeep and Shashi Bhushan caused the injuries on her with the aid of a jack and pana (spanner) apart from cutting her with a blade and also by pouring acid on her head. PW-1 stated that on noticing the condition of the girl, he arranged for shifting her to Muzaffarnagar Government Hospital in the police jeep along with Constable Rambir Singh and the driver of the jeep. It was further stated that accused Sandeep and Shashi Bhushan, on being apprehended, also revealed their names and informed that accused Sandeep used to visit deceased Jyoti while she was working in a mobile shop in Mayur Vihar Phase-1 for the last six months prior to the date of occurrence and developed friendship with her, and that in course of time, deceased Jyoti pressurized him to marry her. On the date of occurrence, around 6 p.m. he stated to have called her over phone to meet him at Laxmi Nagar red-light, that she responded to his call and came to Laxmi Nagar red-light where accused Sandeep was waiting along with his friend Shashi Bhushan who drove the vehicle Indica car bearing registration No. DL 3CR 6666 which belonged to his mother.

> ***Accused Sandeep stated to have extended a promise to marry her at Haridwar. While the vehicle started moving, accused Sandeep asked Jyoti to get the foetus aborted to which she did not agree instead threatened him by saying that she will reveal all facts to his parents as well as to the police and that as they reached Modinagar, he started beating her.***
>
> ***According to the version of accused Sandeep, as told to PW-1, at Modinagar he purchased, two bottles of acid and four shaving blades, that when they reached Khatoli, on seeing an isolated place, they tried to pull out the injured Jyoti from the vehicle and that at that point of time they were apprehended by the police. It is the case of the prosecution that while both the accused were taken into custody, the vehicle in which they were travelling was also seized along with the jack and pana, four blades and two acid bottles. The articles, namely, blood stained floor mat, empty bottles of acid, one pair of ladies footwear were stated to have been seized after preparing a seizure memo.***

A copy of the seizure memo was stated to have been handed over to the accused. It is the specific case of the prosecution that since it was late in the night and it was a lonely place, there were no independent witnesses other than the police personnel. The seizure memo was marked as Exhibit K-1.

* * *

Keeping the (above respective) submissions in mind, when we analyze the case in hand the following facts are indisputable:—

(a) The relationship of Sandeep with deceased, prior to the date of occurrence, namely, 7-11-2004 as his girlfriend;

(b) The deceased was carrying the foetus of six months old in her womb;

(c) The Indica car in which the deceased was found on the date and time of occurrence belonged to the mother of accused Sandeep;

(d) At the time when the deceased was secured by the police on 17-11-2004 at 21.30 hours she was seriously injured but was alive;

(e) The death of the deceased was ascertained by the Dr. B.S. Chaudhary (PW-6) at 10.55 p.m.

(f) As per the post-mortem certificate, there were as many as 17 injuries which were caused by blunt weapons like jack and pana (spanner), shaving blades and also chemical acid.

(g) Police witnesses were all on patrol duty on the date of occurrence.

(h) The DNA test disclosed that accused Sandeep was the biological father of the foetus found in the womb of the deceased.

(i) The theory propounded by the accused i.e., the car was stolen on 17-11-2004 was not established before the trial court in the manner known to law.

(j) The statement of the accused as stated to have been made to PW-1 contained various facts unconnected to the crime and also the self-incriminating facts which could be distinguished.

(k) The absence of any independent witness at the place of occurrence.

21. Having regard to the above factors, we are convinced that the case of the prosecution that the deceased made a statement about the sequence of the occurrence was really made as spelt out by the witnesses PW Nos. 1 to 5.

Another submission made on behalf of the appellant was that there were serious infirmities in preserving and testing of the sample of the foetus and the consequent DNA report implicating the accused Sandeep to the destruction of the foetus whose biological father was found to be the accused himself. The infirmity pointed out was that the sample of the foetus of the child was taken as early as on 17-11-2004 while it was sent for forensic lab only on 25-1-2005 and that since there was a long gap in between, the prosecution ought to have disclosed as to how the samples were properly preserved in order to proper test to be conducted for ascertaining the correctness of its outcome. Though such submission was made with some emphasis, it was not pointed out as to what was the nature of procedure to be followed in regard to the preservation of the samples taken apart from what was followed in taking the samples by the prosecution. It is not in dispute that at the time of post-mortem, when the foetus was discovered, the same was preserved by taking two samples one in the Formalin solution and the other one by ice preservation. It is borne out by record that there was an FSL report dated 5-1-2005 as per which the SSP of Muzaffarnagar was informed that the foetus which was preserved in Formalin solution was not accepted since laboratory had no standard protocol for extracting the amplifiable DNA of Formalin preserved tissues.

> **34.** ***Therefore, in the evidence of PW-10 Junior Scientific Officer of Central Forensic Laboratory, Chandigarh, it was brought out that the blood samples of accused Sandeep and the foetus received by him on 27-1-2005 and that necessary test was conducted based on which a report on 13B/1, 13A/2 and 13C/3 were forwarded which confirmed that the accused Sandeep was the biological father of the foetus. He also confirmed in the cross-examination that the earlier sample of foetus preserved in Formalin solution received on 5-1-2005 was returned back without opening the seal as the same was kept in Formalin solution and standard protocol analysis was not available in the laboratory. He further confirmed that when the sample on second time was received along with the letter dated 25-1-2005, the same was preserved in ice separately which they were able to test in their laboratory for finding out the result. It has also come in his evidence that the collection of samples, preservation of samples and transportation of samples if not carefully done, it may affect the result, but in the case on hand the result reported by him was not based on wrong facts. In the light of the said expert evidence of the Junior Scientific Officer it is too late in the day for the appellant-Sandeep to contend that improper preservation of the foetus would have resulted in a wrong report to the effect that the accused Sandeep was found to be the biological father of the foetus received from the deceased Jyoti. As the said submission is not supported by any relevant material on record and as the appellant was not able to substantiate the said argument with any other supporting material, we do not find any substance in the said submission. The circumstance, namely, the report of the DNA in having concluded that accused Sandeep was the biological father of the recovered foetus of Jyoti was one other relevant circumstance to prove the guilt of the said accused.***

* * *

Case of the prosecution based on the evidence displayed, confirmed the commission of offence by the appellant, without any *iota* of doubt, we are of the considered opinion, that still the case

does not fall within the four corners of the principle of the 'rarest of the rare case'. However, considering the plight of the hapless young lady, who fell a victim to the avaricious conduct and lust of the appellant Sandeep, the manner in which the life of the deceased was snatched away by causing multiple injuries all over the body with all kinds of weapons, no leniency can be shown to the said appellant.

Taking note of the above decision and also taking into account the facts and circumstances of the case on hand, while holding that the imposition of death sentence to the accused Sandeep was not warranted and while awarding life imprisonment we hold that accused Sandeep must serve a minimum of 30 years in jail without remissions before consideration of his case for premature release.

21.10.5 Identity of Mutilated Human Body Parts[14]

(DNA, Odontology, Superimposition)

Author's Summary

It is a shocking inhuman brutal murder of a medical student by a senior medical student. The culprit dismembered the body and disposed off the parts at various places. Parts were recovered at the instance of the culprit. Forensics established that the various body parts belong to the same person. DNA of the parents and body parts established the identity of the deceased as that of their son.

Highlights italicised

Relevant Extracts

In the academic year of 1995-96 the respondent-accused was studying in the senior first year course of MBBS and the deceased-Navarasu, son of Dr. P.K. Ponnusamy [PW-1], a retired Vice-Chancellor of Madras University, was studying in the junior first year course of MBBS in Raja Muthiah Medical College, Annamalai University, Annamalai Nagar. The respondent was staying in room No. 319 of KRM Hostel and the deceased was staying in room No. 95 in E.1 Malligai Hostel belonging to the same medical college campus. PW-1 returned from his foreign trip on 7-11-1996 and was waiting for the arrival of his son-Navarasu from college to celebrate Diwali which in that relevant year fell on 10-11-1996. When Navarasu did not return home till 9-11-1996, PW-1 started enquiring from the friends of his son, available at Madras but no information of his whereabouts could be gathered by the father. PW-1 then on 9-11-1996 rang up the university authorities to find out and ascertain the whereabouts of his son. When he was informed that the college authority found his hostel room locked and when it was broken upon, it was found that his belongings along with a small box were lying in the room but he was not available in the room. The college authorities and the father were of the opinion that Navarasu had not left for Diwali to Madras. PW-1 thereafter rushed to the University on 10-11-96 and made a complaint of missing of his son at about 11.30 p.m. on 10-11-96 which was registered as Crime No. 509 of 1996 [Exhibit-P1].

While this process was going on and without the knowledge of Annamalai Nagar Police, a torso was recovered at about 8.30 a.m. on 7-11-1996 by G. Boopahty, Inspector of Police, E.5 Pattinapakkam [PW-55], from the PTC Bus Depot at Mandaiveli, Madras based on the information given by Prakash 3[PW-53], conductor of

14. *Inspector of Police, Tamil Nadu v John David,* 2011 AIR SCW 2764.

the bus route No. 21G. The said recovered torso was sent for post-mortem after inquest. The Annamalai Nagar Police after registering the missing report started investigation and during the course of such investigation gathered materials and also received information from various persons including students of the college pointing the guilt towards the accused, who was also found absconding from the college premises from 12-14-11-1996. On 14-11-1996 the accused surrendered himself before the Judicial Magistrate, Mannargudi. The message of his surrender was conveyed to the Annamalai Nagar PS, which got the police custody for five days of the accused from 18.11.1996.

On 19-11-1996 at about 1.30 a.m. the accused gave a confessional statement stating that he has put the severed head of the deceased in the boat-canal within the University campus. Pursuant to the said confession, the head was also recovered. Annamalai Nagar PS on 20-11-1996 asked E5. Pattinapakkam PS for sending the records connected with the torso recovered at Madras on the suspicion that it may belong to the severed head of the deceased-Navarasu, which was recovered at the instance of the accused. Dr. K. Ravindran [PW-66] conducted autopsy/post-mortem of the head at 10.00 a.m. on 21-11-1996. On 22-11-1996 a message was received from Villupuram Control Room which was forwarded to Annamalai Nagar PS which mentioned that three human bones femur, tibia and fibula have been recovered at 1.30 a.m. on 21-11-1996 from the seashore of Konimedu of Merkanam based on the information given by the concerned Village Administrative Officer-Nagarajan [PW-43]. Post-mortem of the limbs were conducted by Dr. Srinivasan [PW-45] and later limbs were sent to PW-66. PW-66, after examining the severed head, the torso and three human bones above mentioned, found that there are scientific materials to hold that they belong to a single individual and also the fact that they belong to deceased-Navasaru.

The father of the deceased PW-1 and Thandeeswaran [PW-60], nephew of PW-1, also identified and confirmed that the head and torso are of the deceased.

For confirming the said fact, the sample blood of PW-1 and his wife Baby Ponnusamy [mother of Navasaru] was examined by Dr. G.V. Rao [PW-77] at Hyderabad by DNA test. PW-77 compared the tissues taken from the severed head, torso and limbs and on scientific analysis he found that the same gene found in the blood of PW-1 and Baby Ponnusamy were found in the recovered parts of the body and that therefore they should belong to the only missing son of PW-1.

21.11 ADDITIONAL CASE LAW

21.11.1 DNA Analysis: Court's Directions[15]

Author's Summary

The Definite nature of DNA identification has prompted the court to prove guidelines in the location/collection/preservation/evaluation/comparison of the evidence so as to maintain relevancy/integrity/Authenticity/intact chain of possession and verified evaluation of the evidentiary clues. The court rejected the desire of the defence to supervision or independent second examination.

Highlights italicised

15. *Chandan Panalal Jaiswal v State of Gujarat*, 2004 Cr LJ 2992 : 2005 (1) Guj L H 225 : 2004 (3) Guj L R 2726.

Relevant Extracts (verbatim)

The apprehension expressed before the Court is *qua* the DNA evidence collection of the attempts by highly prejudicial investigating agency. A sample, if not properly collected and/or analysed with, (*i.e.,* of general sample and the crime exhibits), then the same could not be called into question, and the accused shall have to face trial and, therefore, when the petitioners have consistently taken the plea of *alibi*, they should be at least permitted to observe the process of drawing of sample from the body of the person of the accused and the process of examination which was to take place in Forensic Science Laboratory (FSL for short), at least from outside of a window glass.

It is true that the high profile test is considered irrefutable proof of identification and therefore, it is necessary to establish standard of analysis and accuracy in the level of statistical calculations. The laboratory performing such tests should be submitted to Double Blind Test in which neither the Lab nor the Technicians know what the samples are to ensure that they are working with acceptable quality control. In the present case, it is now the say of the petitioners that they may not be subjected to wrong test or a wrong method (*i.e.* outdated method) or that the test is being performed against their will and wish.

On the contrary Mr. Shah submitted that the accused persons are ready to give general samples from their respective body so that they can strengthen their case and the findings may give strength to their plea of *alibi*. But the question raised before the Court is whether the investigating agency can be conferred with the authority to resort to DNA test in absence of any special law enacted by the legislature for the said test. The answer would be that under the Cr. P.C. wide powers of investigation are conferred on the investigating agency and when the present accused are not under police remand/custody, necessary permission can be sought from the Court. The Court can permit, on merit of each case, the investigating agency to take the accused for necessary test such as Narco analysis, lie detection test or finger printing etc. of the accused and to draw general sample from the body of an accused person. But obviously, when an accused is asked to undergo DNA analysis while granting such permission to the said authority/agency (when it comes to DNA finger printing analysis/test) appropriate directions can be issued to safeguard the interest of the accused and other relevant aspects as the test has been believed to be conclusive even though the same is sensitive from all biotechnological and sociological point of view. There should not be permission for an invasion on individual privacy and, therefore, the 3 (three) factors determining the seriousness of invasion of privacy pointed out by Mr. Shah should be taken care of. These three factors are:

a. whether the person has a reasonable expectation that the information is private and will be accessible by others only with the person's consent;

b. how sensitive the information is *i.e.*, what impact on them might be from non-consensual disclosure and;

c. how invasive the method of obtaining the information is? And under such circumstances special safeguards are required to be enacted to protect the information pertaining to Individual DNA analysis/test.

At this juncture, I would like to quote some part from the book published by Person Education having heading "Understanding Biotechnology" from Chapter 10 titled as "Forensic DNA" wherein the author has stated that.

> *Considering the DNA analysis a powerful identification technique, it should be used carefully. The sensitivity level of many DNA test is so high that cells from a Technician's hands or from its sneeze could contaminate the sample. Therefore, care in the collection, custody and manipulation by the biological sample is of great importance for the validity of this analysis. Finally, human being can make mistakes. Technicians can mislabel a flask, change codes, change names and so on. Due to many possible errors, many laboratories use double reading in each step of the, analysis. They also save part of the sample for possible re-analysis.*

It would be also proper to quote a very relevant portion from a book titled as "Foundation for DNA Finger Printing Evidence" by Jeffrey Lee Ashton dealing with The Evidentiary Matter" and the same is about 'chain of custody':

> *Proof of the chain of the custody of sample used in DNA identity testing present no unusual problems. Procedures already used for collection, storage and transportations of sample used in the standard serology will suffice well for samples used in DNA testing. Care should be taken to seal and label samples properly to ensure the future integrity and the identification of the samples…*

Irrespective of the request made by the accused, the Courts are supposed to ensure the laboratory accuracy and should also focus while granting such permission and asking the present accused to undergo DNA finger printing test/analysis on the aspect of 'laboratory error.'

Expressing apprehension of vanishing of the entire crime exhibits, it is argued that where there is no scope of duplicate tests of a particular crime exhibit, the prayer of the petitioner being innocuous, should be accepted and the petitioners may be permitted to keep their DNA Forensic examiner (expert) present right from the stage of collection of blood samples till the test analysis are performed.

Mr. Oza, learned PP, has strongly resisted the submission and has pointed out that there is no scope of errors as pointed out by Mr. Shah and the apprehension expressed by him is in reference to the methods earlier adopted by the FSL in performing DNA Finger Printing Test because in early years the Restriction Fragment Length Polymorphism (RFLP) based technology was used. Of course the new technology known as PCR base technology was also adopted during some of these years *i.e.*, between 1987 and 1998. In the year 1997 PCR and sequence based technology was used (which is useful) in determining the material used and/or parental relatedness. At present the latest technology-analysis technique was is STR technology which has some relation with PCR and the sequence based technology. This STR *i.e.*, Short Tandem Repeat is the latest one. So the apprehension expressed by Mr. Shah is only relevant, if any earlier or outdated technology is sought to be adopted for analysis/test, in the present case.

A statement has been made by the learned PP on instructions from Dr. Mehta JT. Director, who was present in the Court at the instance of the Court, that in the present case considering the routine procedure of collection of reference blood sample in DNA identification, a format is being prepared and the same is required to be signed and submitted by the person who gives reference blood from his body and he is required to ensure the authenticity of the blood sample collected for DNA analysis. There is DNA division in the State Laboratory and the format prescribed is to be signed by the responsible medical officer of the hospital and is also supposed to put his seal giving the details providing details in the format prescribed over and above. Such a format carries a recent passport size photograph and the source with a declaration by him as a donor. If the donor is a minor or lunatic or otherwise disabled, such declaration has to be signed by his guardian.

In response to a query raised by the Court, Mr. Shah submitted that the petitioners have no objection if the blood sample is drawn from the source by a responsible medical officer and the petitioners shall be co-operative in preparing and signing the format.

It is relevant to note that DNA Laboratory of FSL, Gujarat State; Ahmedabad has entered into a Mou with Central Forensic science laboratory, Kolkata and Centre for DNA Finger Printing and Diagnostic, Hyderabad. The laboratory facilities, instruments and the techniques followed by all the three laboratories are the same. All the methods/Kits (instruments etc.) used are well-validated for Forensic Identification purpose and in the present case the analysis which is the latest one *i.e.* STR is to be applied. The STR technique is the latest one and its human specific, fast and easy to standardise. The technique is automated which ensure better accuracy and *reproducibility* (emphasis). It is submitted by Mr. Oza that the interpretation of the results is also quite simple and all activities are being done and observed mainly by computers. Therefore, the possible chances of errors are eliminated.

The demand for appointment of an observer is not found acceptable as it may demoralize the Forensic Scientist of FSL who is an independent authority and not working either under police or under the guidance or supervision of police authorities. The Role of FSLs can very well be appreciated in the light of the scheme of section 293, Cr. P.C. and other relevant provisions under which these Laboratories are functioning. It is also relevant to note that appointment of an observer may also lead to contamination including leakage of the confidential report and even some information and aspects which would otherwise are required to be kept secret. The potential defence witnesses whether ever could be permitted to enter the laboratory is also a question and this proposed invasion whether can create any hurdle or embargo in performing the analysis also would be a crucial aspect, if such private experts starts non-co-operation. If the accused persons have any question or doubt as to the method adopted by the FSL experts, then while examining such expert during the trial the accused positively can bring their own expert who can assist the counsel.

The Court can reject the request made of such a nature but, I am afraid, if the relief as prayed for is granted, it would amount to interference by Court in the investigation. The Courts have no role to play during the investigation nor to regulate the same, which is an accepted proposition of law. The learned Magistrate while passing the order under challenge seems to have followed this proposition of law. The ratio of the decision in the case of *UOI v Prakash P. Hinduja*, JT 2003 (5) SC 300 : 2003 Cr LJ 3117 : AIR 2003 SC 2612, could be attracted wherein the Apex Court by referring a case reported in *State of Bihar v J.A.C. Saldanna,* (1980) 1 SCC 554 : 1980 Cr LJ 98 : AIR 1980 SC 326, in the case of has observed that power of the police to investigate into the cognizable offence is ordinarily not to be interfered with by the judiciary. The legal position is absolutely clear and also settled that the Court would not interfere with the investigation. Such an attempt would mean from the time of lodging of FIR till the submission of the report by the Officer-in-Charge of investigation, in the Court under section 173(2), Cr. P.C. this field being exclusively reserved for the investigating agency.

In view of the submissions made by Mr. Oza before the Court and the statement made by him that present analysis technique followed by the FSL, Gujarat State shall be STR which is the latest one, this Court would not interfere in the process to be adopted by the said authorities by granting the relief as prayed. But considering the various aspects brought to the notice of the Court and the other aspects emerging from the record and the materials supplied to the Court while dealing with this revision application, it would be appropriate to give the following directions:

(i) that the authorities should see that blood samples are collected by a responsible medical officer preferably in the jail ward itself and by obtaining a declaration with the photograph in the format shown to the Court during the course of hearing of this petition.

(ii) if required, the petitioner-accused should be taken to the civil hospital and the blood samples should be drawn by a responsible doctor under a police Japta but the same shall not be treated as handing over the accused to Investigating Officer and the accused shall remain in the custody of the jail authorities.

(iii) The FSL, Gujarat State, Ahmedabad should see/ensure that splitting/ division of crime exhibit remains possible. Of course, this would depend upon the size or sufficiency of crime exhibit so that in the event of challenge, duplicate test if required, can be performed as independently as possible and the risk or error can be reduced enormously. If splitting/ division of crime exhibit is not possible, then, in such eventuality, the FSL shall inform the Court about the vanishing of crime exhibit, (totally used) during process.

It is clarified that merely because no specific Act having been enacted by the Legislature in our country, the investigating agency can resort to call upon the suspect/accused to undergo DNA analysis/test. It may be virtually under the powers conferred on the investigator by Cr. P.C. Thus, even if there is a vacuum of legislation, the Court is supposed to see that no authority suffers from any type of prejudice. Maximum care 'if required' should be taken and it would be wrong to presume any inaction or negligence on the part of the said authorities and especially the doctor who is to draw the sample or FSL experts who have to draw the analysis. Committing some laboratory error would result into wrong finding, especially when the State has assured that latest technique *i.e.* STR is to be performed in the present case.

I have gone through the relevant part of the booklet given by Mr. Oza throwing light on STR Typing by Automated DNA Sequencer. This deals with STR Makers in Human Identification. The booklet is prepared for the workshop organized by Central Forensic Science Laboratory, Kolkata and sponsored by Applied Biosystems, USA between 27-9-2003 and 1-10-2003. This Court has no reason to ignore the facts and other details emerging from the work done by the Scholars and gathered in research in recent past.

For short, the apprehension expressed by Mr. Shah is not accepted as well founded. Of course, Mr. Shah and Mr. Oza have assisted this Court immensely by putting their good efforts. Though this is a case where the petitioners-accused have accepted that they would undergo DNA Finger Printing Test to see that their plea of *alibi* can be strengthened from the finding, which may be recorded. But in all other cases also the ratio would remain the same wherein the FSL is asked to play some role in the investigation of a crime because the accused cannot be permitted and should not be permitted to put his own expert either to participate in such investigation or to watch the investigation. Ultimately, it may otherwise, prejudice either the defence or prosecution because it would amount to interference in the process of investigation.

In view of the above observations and directions made in para 20 of the judgment, the revision application deserves to be dismissed. Accordingly, the revision application is dismissed. Rule discharged.

21.11.2 Perfect Identity; DNA Test admissible[16]

Author's Summary

In a scuffle, the victim was injured. His clothes, found in the car of the accused, had bloodstains. The DNA of the stains tallied with the DNA of victim's blood. The culprit stood identified.

Highlights italicised

Relevant Extracts (Verbatim)

The said shirt, which was seized from the said car, was sent to DNA Expert to find out whether the shirt had bloodstains of A-1. The said shirt was marked by DNA Expert as 5(a) and was marked by them as Ex. K. which is M.O. 10 and which is a pink coloured shirt. P.W. 46 DNA Expert was examined in the Court. He holds M.Sc. degree in Criminology and Forensic Science. He also holds Ph.D. degree in Forensic Aspects of DNA and Finger Printing. He further holds a Post-Doctoral qualification in Development of DNA Probes for Forensics. According to his evidence,

16. *Pantangi Balarama Venkata Ganesh v State of Andhra Pradesh*, 2003 Cr LJ 4508 (AP) : 2003 (1) Andh LD (Crl) 789 : 2003 (2) Andh LT (Cri) 9 (AP).

DNA Finger Printing technique is an absolute method for identification, as on today for individualization of biological sample to the probability value of 99.9998 per cent. The theory of technique lies in the fact that each individual inherits DNA from its parents in the proportion of 50:50. DNA present in any person does not match with other person in the world.

According to his evidence, on 17 February 1996 their office received requisition from the Court of the II Additional Munsif Magistrate, Ongole dated 16-2-1996 in which the request was made that four samples of blood of the accused and the injured in Cr. No. 140/95 of Ongole I Town Police Station may be compared by the DNA Finger Printing technique with bloodstained clothing and swabs collected at the scene of offence. Accordingly he carried out the test. We have already stated that the blood samples were already taken with the identity card. They were marked, as KLM being identical DNA finger printing to that of A-1. Thus, the shirt, which was marked as Ex. K and which was marked as M.O. 10 was that of A-1 according to DNA test. Hence, on this evidence, the learned counsel Mr. Kannabhiraman pointed out that the Expert deposed that the blood of A-1 is identical to the blood which has been found on Ex. K.M.O. 10 is identical and it is not the same and therefore the learned counsel has submitted that the mistakes are likely to be there in identifying the blood since the samples were collected two months after the incident. He takes the support of an article written by one Lalji Singh, Centre for Cellular and Molecular Biology, Hyderabad in DNA Profiling and its applications in which the learned Author has observed as under:

> ***Precautions:—DNA profiling is technically demanding. There are cases on record in the US where mistakes seem to have been prompted by human errors. There is a need for quality control. Every precaution should be taken to ensure preparation of high – molecular weight DNA, complete digestion of the samples with appropriate enzymes, and perfect transfer and hybridization of the blot to obtain distinct bands with appropriate control. If necessary the analysis should be repeated. The DNA fingerprinting test, if performed property is infallible. However, there is a need to interpret DNA typing with a thorough understanding of the populations involved.***

We have no hesitation in accepting the proposition. But it cannot be said that in this particular case, human error has crept in unless it is shown by cross-examination. DNA confirms the identity of victims. Then what is DNA? DNA means:

> (Deoxyribonucleic Acid), which is found in the chromosomes of the cells of living beings, is the blueprint of an individual. DNA decides the characteristics of the person such as the colour of the skin, type of hair, nails and so on. Using this genetic fingerprinting identification of an individual is done like in the traditional method of identifying fingerprints of offenders. The identification is hundred per cent precise, experts opine.

The key feature of this technique is that no matter what biological sample is obtained – hair, a bit of skin, blood – the results are not going to be different. This is because all the cells in the body contain the same set of DNA, something unique for each individual.

The test was conducted in *Beena's* murder case.

In the present case, the CFSL and the CCMB conducted tests on the bones recovered by the police and on blood samples of Beena's blood relatives: her mother Rathi Devaiah, brother Nanjappa and sister Gangamma. The results were astounding: the DNA extracted from the bones found to be belonging to a female aged around 20-25 years. The DNA of the bones also tallied with the DNA in the blood samples of Beena's mother, sister and brother and was comparatively of the same genetical order.

The test according to police, had taken much time as the Hyderabad institutions had to seek expert opinion from institutions abroad.

Thus, the evidence of DNA Expert is admissible in evidence as it is a perfect science. In the cross-examination P.W. 46 has deposed as under:

"If the DNA fingerprint of a person matches with that of a sample, it means that the sample has come from that person only. The probability of two persons except identical twins having the same DNA fingerprint is around 1 in 30 billion world population." It means that DNA test gives the perfect identity. It is a very advanced science.

21.11.3 DNA from blood sample of accused[17]

Author's Summary

The DNA obtained from the hair of suspected, vaginal smear slide of the deceased, paizami of deceased and underwear of deceased are matching with the DNA obtained from the blood sample of deceased and blood sample of accused. The testimony of independent witnesses is duly corroborated by the medical evidence and forensic reports. Thus the conviction of accused person is proper.

Relevant Extracts (Verbatim)

The accused allegedly enticing away the victim-girl of 8 years from religious function and thereafter raping her, resulting in her death. The independent witnesses have seen the accused leaving with the deceased after the function was over around midnight. the doctor has categorically deposed that the victim died due to asphyxia as a result of commission of rape. The doctor has further opined that as a result of commission of rape, the victim has undergone acute pain and shock and due to exertion of pressure, she was suffocated. The internal organs of the victim i.e. brain, liver, spleen and kidneys were congested. He has noticed the injuries on the body of the victim, as noticed hereinabove. The doctor has proved the post mortem report. According to the Forensic Science Laboratory report, the soil sticking with the clothes of the deceased matched with the soil lifted from the spot. The Police also sent the samples for DNA. The DNA test performed on the exhibits provided is sufficient to conclude that, (1) The DNA obtained from T-shirt of accused is form a single female human source and matching with the DNA obtained from the blood sample of deceased; (2) The DNA obtained from the hair of suspected, vaginal smear slide of the deceased, paizami of deceased and underwear of deceased are matching with the DNA obtained from the blood sample of deceased and blood sample of accused. Thus the conviction of accused person for rape and murder of minor girl is proper because the testimony of independent witnesses is duly corroborated by the medical evidence and forensic reports.

21.11.4 Taking blood sample for DNA Test is not violative of Article 20(3) of the Constitution[18]

Author's Summary

There was dispute of property between father and son. Father alleged that son was an imposter, not his son. Father wanted DNA test for the proof. The imposter opposed it on the ground that it was against Article 20(3) of the constitution. The superior court found it erroneous and allowed the test.

Highlights italicised

17. *State of Uttarakhand v Karandeep Sharma*, 2018 Cr LJ 2231 (Uttarakhand HC).
18. *Gangadharappa v Basavaraj,* AIR 1996 Kant 155 : 1996 (1) DMC 194 : 1996 (1) Hindu LR 518. Also see *Goutam Kundu v State of West Bengal,* AIR 1993 SC 2295 : 1993 AIR SCW 2325 : 1993 Cr LJ 3233; *Sajeera v PK Salim,* ILR (Ker) 2000 (1) Ker 863 : 2000 Cr LJ 1208 (Ker); *Syed Mohd. Ghouse v Noorunnisa Begum,* 2001 (2) DMC 454 : 2001 (2) Hindu LR 645 : 2001 Cr LJ 2028 (AP).

Relevant Extracts (Verbatim)

The petitioner is the father of the respondent. The respondent herein is the plaintiff in Q.S. No. 26/92. He has instituted the said suit against his father for partition and separate possession of his share in the coparcenary properties. The defendant has resisted the said suit on the ground that the plaintiff is not entitled to claim partition in the joint family properties since he was not born to him. Therefore, he filed I.A. No. 8 under Order 26, rule 10A read with section 151, Code of Civil Procedure for the appointment of a Commissioner for purpose of blood test and genetic finger printing test of the plaintiff to find out whether he is his son. The said application was resisted by the plaintiff on the ground that he could not be compelled to undergo the test as it was violative of article 20(3) of the Constitution of India. The learned Munsiff having upheld the said objection rejected the said I.A.

In my view,the impugned order is erroneous and is liable to be set aside for the following reasons: Clause (3) of Article 20 of the Constitution of India deals with accused's immunity from being compelled to be a witness against himself. This clause gives protection to (i) to a person 'accused of an offence'; (ii) against compulsion 'to be witness', (iii) against himself. Therefore, it is clear from clause (3) of Article 20 that the protection under this clause is confined to criminal proceedings or proceedings of criminal nature before a court of law or other Tribunal before whom a person may be accused of an 'offence' as defined in section 3(38) of the General Clauses Act. It would not, therefore, extend to parties and witnesses in civil proceedings or proceedings other than criminal. In *Mallela Suryanarayana v Vijaya Commercial Bank Ltd.*, AIR 1958 AP 756 : (1958) 2 Andh WR 331 : ILR (1958) AP 651 and *R.P. Ulaganambi v K.C. Loganayaki*, 1986 Cr LJ 1522 : 1986 (2) DMC 79 : 1986 Mad LW (Cri) 122, the High Court of Andhra Pradesh and the High Court of Madras respectively have taken the view that the immunity granted by article 20(3) of the Constitution of India does not extend to civil proceedings and the intendment of this article is to afford some protection to a person involved in a crime, having regard to the predicament in which he would be placed and to interpret it as applying to all proceedings – civil or criminal which might at a subsequent period expose the person concerned to prosecution on the basis of answers given by him, is to enlarge the scope of this article and to defeat justice. Therefore, in my view, the learned Munsiff was not at all right in dismissing I.A. No. 8 on the ground that the prayer made therein amounted to testimonial compulsion violative of Article 20(3).

Under Hindu Law illegitimate sons living together with their putative father do not constitute coparcenary and father has no power to admit them as his coparceners. In my considered view, the trial court in order to enable the defendant to prove that the plaintiff was not born to him and he is not entitled to claim partition in the suit properties ought not to have rejected I.A.S.

For the foregoing reasons, this Revision Petition is allowed. The impugned order on I.A. No. 8 is hereby set aside. I.A. No. 8 is allowed and the trial court shall appoint a Commissioner for the purpose mentioned therein at the cost of the defendant. There shall be no order as to costs.[1]

21.11.5 Choice of Laboratory for Second DNA Test[19]

Author's Summary

It is a simple case of disputed paternity. The complainant wanted the test to be done at Hyderabad. The other party opposed it. The superior court allowed 2nd test but did not accept the choice of the complainant for the laboratory.

Highlights italicised

19. *Vishal Motising Vasava v State of Gujarat,* 2004 Cr LJ 3086 : 2005 (1) Cur Cri R 345 : 2004 (4) Rec Cri R 182.

Relevant Extracts (Verbatim)

Having considered the order dated 25-11-2003 passed by the learned Sessions Judge, it appears that the order passed by the learned Sessions Judge for allowing second DNA test to be conducted of the petitioner cannot be said without jurisdiction or illegal, which would cause any great injustice to the party. As such, the order can be said to be discretionary order which would not call for interference by this Court. I find it proper not to observe further and leave it at that stage, more particularly, in view of the fair stand taken by the learned advocate for the petitioner that the petitioner has also no objection for second DNA test to be conducted at any hospital in Gujarat State.

So far as the insistence of the original complainant for getting the DNA test to be conducted at Hyderabad only and not at any other place and acceptance of such request by the learned Sessions Judge in the impugned order, deserves interference. The complainant may be justified at the most in insistence for second DNA test to be conducted. However, such insistence cannot be stretched to the extent of getting the test conducted at a particular laboratory of the choice of the complainant. If such contentions at the instance of the complainant are accepted, it may leave room to large number of other manipulations and complications. It will be for the State to modulate and regulate such procedure to be undertaken since it will be the duty of the State to ensure that the criminal justice is properly administered in the State. The State for various reasons may decide to get such test to be conducted at the nearest laboratory or in an appropriate case the Court may direct the State to get such test conducted at a particular laboratory, but certainly the complainant cannot be said to have any vested right to get such test conducted at a particular laboratory only. Further, no extraordinary circumstances are recorded by the learned Sessions Judge for accepting the contention of the original complainant to get DNA test conducted at Hyderabad only. It has not come on record that the laboratories for conducting DNA test situated in Gujarat are either not useful or the report may create a doubtful situation. In absence of such material on record, in my view, the learned Sessions Judge has committed error in accepting the contention of the original complainant that the DNA test shall and must be conducted at a laboratory situated at Hyderabad only.[2]

> ***In view of the aforesaid discussion, the order dated 25-11-2003 passed by the learned Sessions Judge below application – Exh. 94 in Sessions Case No. 36/02 shall operate to the extent of ordering the second DNA test of the petitioner by comparing the blood of the child – Piyush. However, the order will stand modified to the extent that such DNA test shall be conducted at any laboratory situated in Gujarat State. It will be for the learned Sessions Judge to decide after hearing both sides for the place of the laboratory anywhere in Gujarat. As and when such test will be conducted for the purpose of blood sample or otherwise, the State shall make arrangements for ensuring that the petitioner is kept present personally for such purpose and the petitioner shall be at liberty to keep his advocate present at the time when blood samples are to be collected. The original complainant shall also be at liberty to remain present either with her parents or advocate of her choice.***

CHAPTER 22

FORENSICS BIOMETRICS

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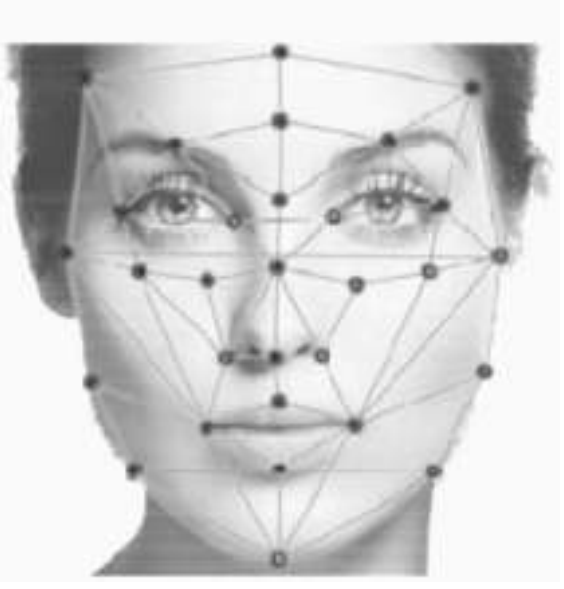

Fig. 22.1
Automated Facial Recognition

22.1 GENERAL

Biometric Forensics is the science of identification of the unique identity of a person through study/measurements of unique characteristics of behaviour/body part. The main advantage of this identifying mode is that the biometric body parts/traits used are personal traits of the individual. They are not lost/stolen/forgotten/misplaced/imitated/destroyed as long as the person lives because the body traits are inseparable parts of the physiology or psychology (behaviour) of the individual.

Biometric traits are being used extensively and increasingly for definite and quick identification of persons, at entry points to some institutions and installations and identification of important paper/electronic documents. They are becoming indispensable for security in many working places. Biometric identification is unique, personal and always available, is being preferred to passwords, pin codes, identity cards, and other identifying modes as the latter can be lost, forgotten, stolen or forged. It is not so with biometric identifying elements.

Modern technology has simplified the processes. Automation, in processing biometric data for the identification of a person is available in a database template, stored in a computer.

The biometric entities being used for the identification of the individuals are many. The nature and frequency of the use, the cost of the technology, the speed and personal preferences are the factors, which decide the selection of the biometric element for a particular need. The automated comparison to ascertain match/non-match is proving to be high cost and time effective.

22.2 NATURE

Forensic Biometrics is of two types:

1. Physiological biometrics
2. Natural behavioural biometrics

Both types of biometrics are individualistic and unique to the individual. They identify him. Those body/behaviour traits of the individual, singly or severally, establish his identity beyond a reasonable doubt.

22.2.1 Physiological biometrics

Physiological biometrics involves the measurements of body parts. Almost any part of the body can be used, however, commonly used body parts are:

1. Fingerprints/palm prints
2. Iris
3. Facial features
4. Retina
5. DNA

There are many other physiology elements that are being investigated for use in biometric identifications, including:

1. Ear prints
2. Footprints
3. Lip prints

4. Body odours/scents
5. Brain profiling[1]
6. Heart functioning[2]
7. Face Images
8. Facial physiology
9. Hand thermograms
10. Veins: e.g., hand veins
11. Hand geometry

22.2.2 Behavioural Biometrics

The behavioural biometrics is a study of such identifying features of a person that are conditioned by the influence of his behaviour, subconscious mind and life experience accumulated unconsciously over the years. The characteristic features are, of course, created by body parts. Currently, Behavioural Forensic Biometrics scientists are using mainly the following:

1. Voice Identification
2. Handwriting/signatures identification
3. Gait Pattern
4. Linguistics
5. Odour Identification
6. Intent discovery/identification

The behavioural characteristics, excluding 1 and 2 are being explored through research and investigation.

Forensic Biometric Elements		
Physiological Biometric Element		
S No.	Biometric Element	Characteristics Used
I	Fingerprints	Ridge Characteristics
2	Iris	Pattern
3	Retina patterns	Vein structures
4	Facial features	Inter-distances of facial features
5	DNA	Inherited code
6	Lip prints	Lip striations
7	Ear print	Outer features of the ear
8	Hand Geometry	Measurements on palm/fingers
9	Vein (hand) Thermometry	Pattern

1. The instrument used is electroencephalograph, the same as used in brain profiling.
2. Instrument used is electrocardiograph.
   Both (1,2) are being investigated for field applications.

Behavioural biometric Element		
1	Voice	Sound spectrographic Traces
2	Signature Handwriting	Writing Characteristics
3	Gait Pattern	Pattern analysis

Biometrics has been in use for identification of human beings over the centuries. The use had been limited but it was increasing over time. However, the need for irrefutable, undeniable and inimitable identity has now, acquired tremendous importance, thanks to computers, the Internet, globalisation of the society/business and migrations of the populations. The computer, the Internet and their siblings (offshoots): online banking/transactions, telemarketing, online cashless business, and increasing crimes like terrorism, bank frauds, narcotics trade, illegal immigration , money laundering, have forced the hands of all governments/business communities and other organisations to adopt Forensic biometrics on large scale to fight the expanding needs. Forensic Biometric, consequently, is occupying the top slot in the identification of the criminal, the one not so criminal and the honest person for the smooth functioning of the society.

22.3 IMPORTANCE

Forensic Biometric system is a system for the identification and segregation of persons. The system of identifications has numerous advantages: it is unique; it is universal, not acceptable to acceptable forgery and it is available in most of the crime situations. The Forensic biometric identification systems are highly utilitarian:

1. Authentication of the person, that he is 'he', is used extensively in security system, banking system and online transactions. It is being used increasingly for:
   - Access control to institution/offices/factories /military installations/buildings
   - Observing a suspect, under surveillance, in a crowd
   - Preparing biometrics data of suspects (terrorist!) and pre-empt their strike.
2. Search for the identity of an unknown person; e.g., a fugitive criminal. The creation of biometric *Portrait Parle* has made the search time/cost-effective. The biometric data of the suspect/culprit is prepared and it is fed into the computer containing the database of the convicted criminals. The computer's matching software compares the data and gives the verdict:

22.3.1 "Match" or "non-match"

3. The identification of a person (criminal) in a crowd is becoming an important application of forensic Biometrics and keeps a watch on his movement throughout. For example, the terrorist, being pursued often mixes up in a crowd. If Biometric data is available it is easy to follow him.

22.4 HANDLING BIOMETRIC EVIDENCE

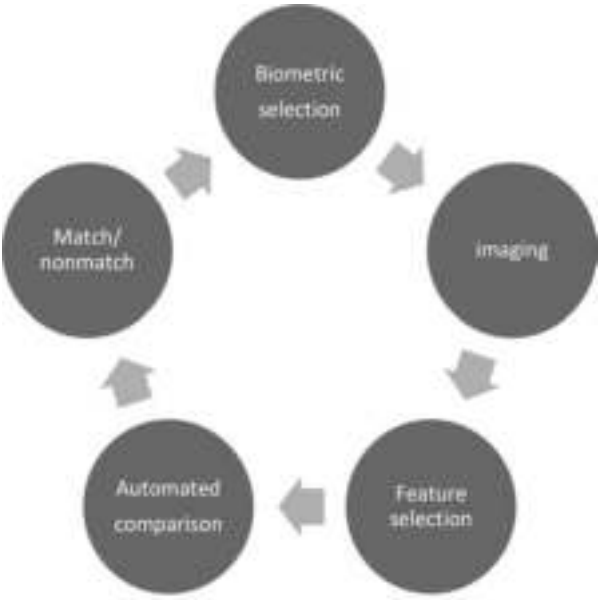

Fig. 22.2
Forensic Biometric Process

The forensic biometrics involves acquisition/editing/storage/retrieval of the biometric data from various sources in digital form. All the processes must be accurate, efficient and secure if the captured data is to provide real Forensic Biometrics service. The process involves the following steps:

22.4.1 Selection of Biometric Entities: Principles

The most important step in using biometrics for forensic purpose is the selection of appropriate biometric entity (trait) because there is no trait, which can fit in all situations. Trait selected should be:

1. Unique
2. Permanent, (like fingerprints, DNA, Retina, Iris)
3. Acquisition savvy
4. Collection/Measurement/recording/extraction savvy
5. Time saver/efficient
6. Accurate
7. Reliable
8. Universal
9. Acceptable to all concerned, and
10. Cost-effective

The forensic biometrics entities have varying number of these qualities, the best being the DNA and fingerprints.

The choice of the trait depends mainly upon the questioned biometric identity. If there are numerous traits that can be used for a particular purpose, then the performance, population coverage, accuracy, convenience, and security (against identity theft, spoofing) aspects decide the choice. The organisational requirements, available equipment and the personal preferences of the expert also affect the choice.

If the Biometrics facility is being created *Ab initio*, (for authentication/identification records), the best items are:

1. Fingerprints
2. DNA
3. Retina
4. Iris

22.4.2 Database

A Database is the collection/storage of the templates of identifying characteristics of individuals from one of their biometrics entities. Some countries have built up huge databases. The most frequently prepared databases are of fingerprints and DNA. Most advanced countries have Fingerprint databases. The data for the database bank follows the following drill:

1. A biometrics reader scans the collectedselected biometrics data for its suitability for database bank.
2. Usually a person oversees the data capture process to ensure integrity.
3. The digital images are thoroughly scrutinised and complete and clear images are selected to extract identifying characteristics.
4. A number of digital images are taken.
5. Software extracts the identifying features and generates a compact yet comprehensive template.
6. The templates are usually stored in central database banks on national /regional bases or on smart cards.
7. It is common practice to prepare more than one templates of the same individual to cater for process variations.
8. The template of an individual is updated frequently

22.4.3 Collection /Capture Drill

The capture process is digital imaging from the various disputed or standard sources. The captured image is then edited to improve the image, enhance its readability/intelligibility and remove the noise. After the processing, the image is framed in a template. The work involves the following sub-steps:

1. The first step in the acquisition of biometric evidence system is to take a digital image to collect/acquire/capture information from the questioned biometric entity in digital form.
2. A digital image of biometric information, corresponding to the questioned entity, is taken from the suspected source(s) through digital photograph or scanning or both.

22.4.4 Identifying data Capture

Fixing/selection/capture of identifying data/traits is the next logical step. It is an important function. High quality and the complete digital image are selected for the extraction of identifying characteristics. A number of clear and important characteristics are selected to create the identifying template for comparison and match. For example, in fingerprints, an adequate number of identifying features like ridge termination/bifurcation/crossing/short ridges/loop formation/gap in the ridges and many more ridge characteristics are captured and used for the identification of the person to whom the print belongs. The position and the orientation of the identifying characters determine its evidential value.

Once the template is ready, it is stored in the computer or in some other similar device (smart cards are used for smaller data bank) and used for comparing/matching the data with authentic/questioned data.

22.4.5 Comparison/Matching process

A matcher (comparator) device is used for matching/comparison. The template carrying data of the unknown person is placed in the comparator, which has template(s) of known person(s). The device compares the identifying characteristics on the new template with the template(s) present there. If the number of matching minutiae is equal to or above the threshold number the identity id declared if it is less than the threshold number, a non-match/non-identity is reported. Thus the matching machine comparison gives identity/non-identity of the person. The results are utilised for required (varied) purposes.

22.4.6 Biometrics Sensors

There are many types of sensors used in biometrics. They vary according to the nature of the biometric entity being studied and the data thereof being collected. The prominent among them are:

1. Fingerprint Recognition.[3]
2. Face Recognition.
3. Iris Recognition.
4. Voice Recognition Sound spectrograph[4]
5. Signature Recognition[5]
6. Retina sensor
7. DNA profiling paraphernalia[6]
8. Brain Electrical waves printing[7]

The details relating to the equipment is beyond the scope of this presentation. The titles of the topics give some ideas about their contents.

3. For details, see the Chapter 5 on *Fingerprints.*
4. For details, see Chapter 29 on *Voice Analysis.*
5. For details, see author's book on *Handwriting Forensics.*
6. For details, see Chapter 21 on *DNA Profiling.*
7. For some details, see Chapter 30 on *Forensic Psychology.*

22.5 INDIVIDUAL BIOMETRIC ELEMENTS

What Forensic Biometrics elements are being used in the identification of individuals? As seen above, any body part and any behavioural trait can be used as an element for biometric forensics. However, some elements are easier to work with than other elements and give better results. Scientists have been researching (and the research continues) on a number of these elements (about 20) are under scrutiny. Here it is proposed to discuss only those that are frequently utilised or are likely to be utilised in the near future; namely:

1. Iris
2. Retina
3. DNA
4. Fingerprints/palm prints
5. Facial features

22.5.1 Iris

22.5.1.1 Nature

The iris is the annular region of the eye bounded by the pupil and the sclera (white of the eye) on either side. The visual texture of the iris is formed during fetal development and stabilises during the first two years of life. Complex iris texture carries very distinctive information useful for personal recognition. The accuracy and speed of currently deployed iris-based recognition systems are promising and point to the feasibility of large-scale identification systems based on iris information. Each iris is distinctive and, like fingerprints, even the irises of identical twins are different. It is extremely difficult to surgically tamper the texture of the iris. Further, it is rather easy to detect artificial irises (e.g., designer contact lenses). Although the early iris-based recognition systems required considerable user participation and were expensive, the newer systems have become more user-friendly and cost-effective.

The iris is a thin, circular structure in the eye, responsible for controlling the diameter and size of the pupil and thus, controlling the amount of light reaching the retina. In the figure below it is the blue area, around the pupil (the circular black spot) in its centre, and white sclera all around. Cornea over the iris is completely transparent. It is, therefore, not visible.

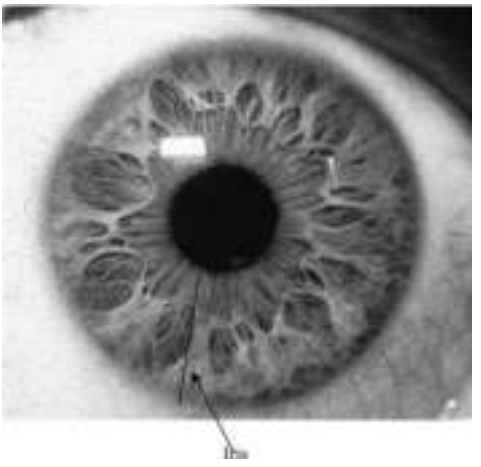

Fig. 22.3

The formation of iris starts at the fetal stage and is complete in about two years after birth when it becomes a permanent biometrics element for each eye. It is unique not only for an individual but it is unique for each eye. Unlike DNA, the iris patterns are different even for identical twins.

The intricate iris structure patterns of each eye of all individuals are distinctive and individualistic. The individuality confers a unique identity to the subject and permits his identification.

22.5.1.2 Ideal identity Feature

The iris is the ideal part of the human body for biometric identification for several reasons including the following:

1) Being an internal body part, it is well protected against accidental/intentional damage or fiddling.
2) Iris is more or less flat. It permits better scanning. Scan can be taken covertly even from a distance, of a few metres.
3) The iris is a random (haphazard) formation during embryonic development. No two identical iris patterns have ever been found, not even in identical twins. The patterns are intricate. They are, therefore, taken as unique[8]. Besides, the formation of these patterns involves so many factors that the chances of duplication are almost next to nil. We have already seen that iris patterns even in two eyes (the left and right eyes) of the same person, or of identical twins (genetically identical persons) are different.

22.5.1.3 Scanning

The iris scanning software has come up, which has almost eliminated the false match (chances $< 1o^{-11}$). Some medical/surgical interventions, sometimes, affect the overall shape of the iris. However, the iris patterns remain unchanged for decades. In one case, an individual was identified even after 30 years through an iris pattern.

22.5.1.4 Advantages

The iris identification offers many advantages:

1. Iris patterns are permanent throughout life.
2. They are unique due to the high complexity of the patterns.
3. They, even from the two eyes of the same person/identical twins, differ.
4. Iris is well-protected internal organ. It cannot be stolen/lost/duplicated/fiddled with.
5. The patterns are easily collected (scanned) and correctly identified.
6. The iris patterns Identification is time/cost-effective.
7. They are amenable for automated use on data from large populations.
8. It is almost impossible to change the iris patterns even by surgery.
9. Fake iris patterns (on designer's contact lenses) are easily exposed/identified.

8. There appears to be no mode (experimental or mathematical) to prove that the iris patterns are unique except that alike patterns have not been found so far. The problem of proof is similar to that of fingerprints!

10. Recent technology has made iris identification-user friendly.
11. Iris pattern can be photographed from a distance even (a few metres).
12. Covert scanning is possible.
13. There are infinite variations in the iris pattern as the creation of the iris is random.
14. Iris patterns can be identified even when the subject is wearing clear contact lenses/spectacles.

22.5.1.5 Disadvantages of the Iris for Identification

1. Small target (1 cm) to acquire from a distance (1 m)
2. Located behind a curved, wet, reflecting surface
3. Obscured by eyelashes, lenses, reflections
4. Partially occluded by eyelids, often drooping
5. Deforms non-elastically as pupil changes the size
6. Illumination should not be visible or bright
7. Some negative (Orwellian) connotations

22.5.2 Retina

Verification/authentication of the identity of an individual through retina biometrics has become one of the most important technologies in Forensics biometrics. The main reasons for its tremendous importance are:

- They are individualistic. Even the identical twins have different retina patterns
- The patterns remain unchanged throughout life. However, eye diseases, diabetes, blood pressures; AIDS bring in changes.
- It is an internal organ and therefore, it not easy to fiddle with its features.

The retina is located on a thin nerve at the back of the eyeballs. The light passing through the eyeballs impinges on the retina to create the vision of the objects from which the light had come.

The capture, analysis and identification, of the pattern of blood vessels on the retina of a person, is fairly tricky. The subject is made to sit close to the lens of the scanner (a special type of camera), asked to gaze directly into the lens, and remain perfectly still and focus on a rotating (revolving) light. The camera, during the process, scans the retina. Any movement can interfere with the process and can require restarting. The process may take about a minute or more. The generated template is one of the smallest (only 96 bytes), of the biometric technologies.

The fact that the retina is small, internal, and difficult to measure, makes capturing its image difficult and cumbersome that has limited its use. Newer time/cost-effective processes are being evolved/explored.

The retina identification mode is highly accurate/reliable. Once its working is streamlined, it is likely to be used more frequently in regulating the entries to important buildings, sites, and installations.

22.5.3 Face

Face recognition is a non-invasive mode. Facial images are probably the most common biometric characteristic for personal recognition. The applications of facial recognition range from a static, controlled "mug-shot" verification to a dynamic, uncontrolled face identification in a cluttered background (e.g., airport). The most popular approaches to face recognition are based on either:

1) the location and shape of facial attributes such as the eyes, eyebrows, nose, lips and chin, and their spatial relationships, or
2) the overall (global) analysis of the face image that represents a face as a weighted combination of a number of canonical faces.

While the verification performance of the face recognition systems that are commercially available is reasonable, they impose many restrictions on the modes of obtaining the facial images. These systems also have difficulty in the identification of a face if the images are taken from two drastically different views or illuminations. For a facial recognition system to work well in practice, it should automatically:

1) detect whether a face is present in the acquired image;
2) locate the face if there is one; and
3) recognise the face from a general viewpoint (i.e., from any pose).

22.5.4 DNA Profiling[9]

DNA (deoxyribonucleic acid) profiling is the ultimate unique code for one's individuality. Only identical twins have identical DNA patterns.

The correct identification of criminals/victims/mental patients/heirs/parentage of children and other individuals has always been one of the most important problems in criminal and civil investigations. The best and certain method had been the identification through fingerprints. This fingerprint identification mode was discovered at the fag end of the nineteenth century. It has been helping the criminal justice system tremendously since then; wherever it was adopted. Now, a similar but a more potent and versatile mode, with far wider ramifications, has been found. It has revolutionised the criminal investigation and trials. It is DNA profiling.

There are two types of DNA, nuclear DNA (nDNA) and mitochondrial DNA (mito DNA). Both are used in the identifications of individuals. However, nuclear DNA is better, with wider applications and specific identifications. The DNA profile of the clue material is compared with that of material from the suspected source to ascertain the identity or non-identity of the common source. If the standard sample s not available from the suspected source, body cells, from his close blood relation(s) can provide the DNA profile for comparison. Further, mitochondrial DNA from hair and bone, where nuclear DNA is not available, can be used for the identification.

The identification *via* DNA profiling is superior to other methods of identification in many respects.

22.5.5 Fingerprints

Fingerprints for biometric identification have assumed great importance in recent times. It is used extensively in the security system, banking system, online transactions and for access control to institution/offices/factories /military installations/buildings.

9. For details see chapter on 'DNA Profiling'

A fingerprint is the pattern of ridges and valleys on the surface of a fingertip, the formation of which is determined during the first seven months of fetal development. Fingerprints of identical twins are different and so are the prints on each finger of the same person. It is possible to embed fingerprint-based biometric in a laptop computer. The accuracy of the currently available fingerprint recognition systems is adequate for verification systems and small- to medium-scale identification systems involving a few hundred users. Multiple fingerprints of a person provide additional information to allow for large-scale recognition involving millions of identities. One problem with the current fingerprint recognition systems is that they require a large number of computational resources, especially when operating in the identification mode. Automatic identification is sometimes hindered because of genetic factors, ageing, environmental, or occupational reasons (e.g., manual workers may have a large number of cuts and bruises on their fingerprints that keep changing).

22.5.6 Gait[10]

Gait pattern is the walking picture of an individual. It is a complex spatio-temporal biometric. It has been utilised in the identification of criminal when they are caught in the CCTV.

Gait pattern is not very distinctive, but is sufficiently discriminatory and can indicate the possible person. In India, khojis[11] have used to help apprehend criminal from gait pattern marks.

Gait pattern is a behavioural biometric. It changes over a long period, due to fluctuations in body weight, major injuries involving joints or brain, or due to inebriety.

Gait pattern acquisition is an acceptable biometric. It is mainly evaluated from video-sequence footage of a walking person. Several different movements of each articulate joint are studied and evaluated.

22.5.7 Ear

The shape of the ear and the structure of the cartilaginous tissue of the pina are highly individualistic. The ear recognition approaches are based on recording the distance of salient points on the pinna from a landmark location on the ear. The features of an ear are very distinctive but the images often defy individualisation of the identity of the person.

22.5.8 Signature

The way a person writes and the way he writes his signatures are known to be a highly characteristic, individualistic in most of the cases of writers. They have been accepted in government, legal, and commercial transactions as a method of identification of the signatory.

Signatures are a behavioural biometric that change over time and are influenced by physical and emotional conditions of the signatories.

No person can write his signatures exactly alike twice even when he writes the two signatures one after the other. The variations, however, are of minor and within limits. They do not interfere in the identification of the writer unless master forger has reproduced the signatures.

10. For details, see Chapter 6 on Track Marks.
11. Tracker worked in North-West, India.

Handwritten signature authentications are of two types:

1. Signature verification and
2. Signature identification

The signature verification system decides if a given signature belongs to a person who professes that they are his signatures. Signature authentication can be static or dynamic. In the static mode (referred to as off-line), only the digital image of the signature is available. In the dynamic mode, also called "on-line", a graphic tablet acquires the signature's data by means of or a pen-sensitive computer display. Data includes measurements of parameters of pressure, acceleration, speed, rhythm, and movements.

Specific software extracts the features from the signatures, compares the extracted features in both static and dynamic signatures, and decides whether the signatures have been written by one person or not.

22.5.9 Voice

Both physiological and behavioural biometrics influence voice. The voice characteristics are determined by the shape and size of the appendages: vocal tracts, mouth, nasal cavities, and lips. The characteristics of human speech change over time due to age, health conditions, and emotional state of mind.

Voice identification has been used extensively in Forensics for a long time. It is not very distinctive and not appropriate for large-scale identifications. It is however, being adopted for biometric forensics.

A text-dependent voice recognition system is used for the identification of the voice uttered in a predetermined phrase.

A text-independent voice recognition system also exists, which is more difficult to design but offers more protection against fraud.

A distinct disadvantage of voice-based recognition is that speech features are sensitive to a number of factors such as background noise, attempted disguise.

Speaker recognition is most appropriate in phone-based applications, but the voice signal over the phone is typically degraded in quality by the microphone and the communication channel.

22.5.10 Biometric Intent

In recent times, new biometrics, called biometrics of intent based on brain (electroencephalogram) and heart (electrocardiogram) signals is coming up. It aims to scan *intent.*

The research has shown that people have certain distinct specific brain and heart patterns. The patterns permit the identification of individuals. The technology is fraud-resistant.

The technologies are cumbersome and of low accuracy at this stage of development.

The researchers in Forensic biometrics are also analysing physiological features such as eye movement, body temperature, breathing, and predict dangerous behaviour or hostile intent before it materialises into action.

22.6 CONCLUSION

To sum up, each biometric technique is admissible and there is no optimal biometric characteristic. For example, it is well known that both the fingerprint-based and iris-based techniques are more accurate than the voice-based techniques. However, in a telebanking application, the voice-based technique may be preferred since it can be integrated seamlessly into the existing telephone system. However, a forensic biometric identification method needs to be:

1. Logical, balanced, robust,
2. Validated, verifiable and infallible
3. Provide strong supporting data for the findings
4. Provide reliable results in forensic conditions
5. Provide the range and limits of use of the method

22.6.1 Additional Reading

Anil K. Jain, Arun Ross, and Salil Prabhakar., (2004) ***"An Introduction to Biometric Recognition,"*** IEEE Transactions on Circuits and Systems for Video Technologies, vol 14.

CHAPTER 23

DEATH INVESTIGATION

(ELEMENTARY FORENSIC MEDICINE)

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Fig. 23.1
A dead body floating in Chandigarh lake

23.1 INTRODUCTION

Death investigation is the most important assignment given to an investigating officer, as murder is the most heinous crime. It needs skill, experience, intelligence and the ability to win the confidence of persons to get information and cooperation from them.

All sudden deaths are not murders, accidents or suicides. In fact, in the UK they have calculated that about 80% of sudden deaths are natural deaths (act of God). Only about 20% of deaths are unnatural — suicide, accidents or murders.

There is an old saying that "dead man tells no tales." It is no longer true. A corpse, in competent hands, helps to establish:

- *Corpus delicti*
- His identity
- The time of death
- The cause of death

- The *modus operandi,* and
- Linkage, through clues, of the culprit the victim, the scene, the weapon of offence and other paraphernalia involved in the crime.

The investigation of death involves a multi-pronged approach:

23.1.1 Examination of the Scene

Examination of the scene of occurrence is an important step in the investigation of death. The general aspects of the examination of the scene have already been discussed.[1] The chapter has covered Proper protection, detailed documentation (videography, photography, sketching, textual description, search, collection, preservation, and despatch of evidentiary clues) and reconstruction of the occurrence. Here we discuss death investigation specific aspect only:

23.1.2 Indoor Scene

The IO pays special attention to the following aspects of the indoor crime scene:

1) **Suicide note;** it may be real or fake. In about one-third cases the person committing suicide leaves a suicide note.
2) **Hiding places**; most of the criminals, if they have the time, they hide the incriminating objects including the weapon of offence, discarded garments, materials used for wiping stains. The IO identifies the places and seizes the hidden objects. They carry vital evidence, even fingerprints.
3) **Conditions of the premises**; doors, windows, lighting, heating, fireplaces, dustbins, waste heaps, and nearby vacant spaces are examined. Documents, garments, and other clues may have been burnt/thrown/buried. Residual fragments may still be available.

   Kitchens, bathrooms, toilets may give useful indication and presence of washed blood. Towels may carry bloodstains. There may be even fingerprints on taps and washbasins.

   Walls, ceiling, windows, and ventilators may carry bullet damage or marks in cases of shooting. They are located and documented. If bullets are found embedded, they are extracted carefully to avoid further damage.

   Ashtrays, waste paper baskets, waste heaps, and dumps are searched for incriminating clues.

If there is evidence of eating or drinking, remnants of the food/drink and their containers are carefully collected and processed for incriminatory evidence.

23.1.3 Outdoor Scene

In the examination of outdoor scenes the IO pays attention to:

1) Protect the scene from the curiosity hunters and the involved criminal or their sympathisers. Only the investigator(s) should enter the scenes. He:
   - Cordons off the concerned area.
   - Formulates a plan for examination of the scene.
   - Employs minimum persons to search the scene.
   - Examines the scene during the day, if possible. Otherwise, he uses floodlights.

1. See discussion in chapter 4 on Scene of Occurrence.

2) Process the scene the earliest. Delay destroys evidence. Dust storm, rain, floods, and traffic are potential destroyers. In addition, interested men can and do damage the evidence.
3) Record the disturbed foliage. It may indicate the path of the fugitive, the flight of bullet/missiles/objects, hiding place of a weapon of offence.
4) Preserve/protect biological evidence (skin, flesh, and blood, hair) to prevent destruction/putrefaction/contamination; or, displacement by beasts.

23.1.4 Signs of Struggle

Scrutinise the scene for signs of a struggle:

1. Upturned furniture,
2. Splattered blood,
3. Pulled out hair,
4. Marks of weapon of offence at the scene: doors, walls, furniture,
5. Foot or footwear marks on floors, furniture, bed,
6. Foreign material like bullets, cartridges, cartridge cases, fragments of weapon of offence, powder residues,
7. Defence injuries on the person of the deceased.

23.1.5 Real or Fake Scene

The following factors indicate the fake scene:

1. The quantity of blood at the scene *vis-a-vis* the extent of the injuries is less.
2. Nature, position, size, direction of stains of other body fluids especially semen, saliva, urine and faeces, does not correspond with the given facts.
3. The version(s) of the occurrence is incompatible with the condition/disposition of clothes: state of buttons, tears, displacement, abrasion, creasing, staining.
4. The evidence: blood, bullets, cartridge cases, semen, and other items, underneath the body; may falsify the given version.

23.1.6 Side Information

IO collects side information:

1. Who was the victim?
2. Who saw him alive last?
3. Who was to meet the victim?
4. Who would gain by his death?
5. Who would lose by his death?
6. How much money did the victim carry on his person at the time of death?
7. What was the victim doing when he met his end?
8. What does the psychological autopsy of the victim indicate?
    - Depressed?
    - Stressed?

- Suicidal tendencies?
- Moody?
- Eccentric?

9. Was the victim drunk or under the influence of drug(s)?
10. Who found the victim? Relations or friends or business associates?

23.1.7 Examination of the dead

Examination of the corpse at the scene is done routinely. The investigator officer prepares the inquest report. It must be thorough. However, it should be limited to external examination only. A medico-legal expert does a detailed examination in a post-mortem examination.

The investigating officer should:

1. Confirm death.
2. Photograph the body "as is, where is".
3. Sketch the position of the body.
4. Record the description of the body, the position of the body *vis-a-vis* other articles at thescene. Describe the body fully: head, trunk, arms, and legs. He takes special care to describe the position/condition of the head, mouth, eyes.
5. Record the injuries carefully. Figure out the nature of the weapon of offence.
6. Record the bloodstains on and around the body without disturbing the body: their size, position, direction.
7. Record if there is blood froth (blood mixed with saliva and air). Usually, it occurs when blood enters into air passage while the person is still alive. But in some cases putrefaction may give out froth.
8. Estimate the quantity of blood at the scene. Is it consistent with the injuries?
9. Note the number, size, nature and position of other stains.
10. Record the condition of the clothes of the victim.
11. Outline the position of the body with chalk before removal.
12. Place the dead body in a clean white, plastic sheet for its transfer to the mortuary.

23.2 POST-MORTEM EXAMINATION

Post-mortem examination of the dead, in cases of a sudden and suspicious death, is done in all cases routinely. It has great value. The IO participates actively. He should:

- Remain present at the time of post-mortem examination.
- Ensure collection of all evidentiary clues.
- Get the body (clothed as well as naked) photographed to preserve the evidence on the person of the deceased. Colour photography is superior to record the nature and extent of injuries. Obtain close up photographs of the injuries and other evidence on the person of the deceased
- Collect clothes invariably. They should be properly marked for identity.
- Collect relevant samples of blood, hairs, fingerprints, and viscera if required.

The government medical officers working as medical practitioners do the post-mortem examination and other medico-legal work, in India. Specialists in the field are available only in metropolitan cities or in medical colleges. Most of the doctors elsewhere do not possess the necessary expertise in the medico-legal work. They are unable to do justice to this important work. The cause of justice suffers. There is, however, increasing realisation of the lacunae and efforts are being made to take remedial measures.

23.2.1 Importance

The post-mortem examination provides important evidence relating to death. It helps to:

1. Fix the *corpus delicti* and the cause of death.
2. Ascertain if it is Suicide? Accident? Homicide? Or, killing in Self-defence?
3. Indicate the weapon of offence: (firearm, sharp-edged weapon, blunt weapon).
4. Give the number of injuries and *inter alia* the number of weapon(s) or the number of assailants, under favourable circumstances.
5. Determine the sequence of events of the incident.
6. Determine the evidence of other crime (sexual assault), if any.
7. Confirm/discard a given version or provide a new version of the occurrence.
8. Provide identification data on the victim, in the case of an unidentified body.
9. Collect evidentiary clues: foreign matter, glass pieces, part of broken weapon, projectiles, GSR.
10. Collect viscera, blood, urine, other body fluids, hairs, nails, bones for further investigations.
11. Determine the serious nature (fatal or non-fatal) of injuries.

In short, post-mortem examination helps the criminal justice system to establish the *corpus delicti*, the *modus operandi*, the sequence of events and to locate, collect and preserve clues to link the criminal with the crime, with the crime scene and with the victim *inter se*!

23.2.2 Basic Steps

The basic steps in proper post-mortem examination in death cases are to:

1. Take photographs of the deceased before the examination, during an examination, and after the examination. The facial features, other identification marks (tattoo marks, any deformity,) are photographed. They help to identify the deceased, especially in the identification of unidentified and excessively putrefied or mutilated bodies.
2. Obtain the case history.
3. Visit the scene of occurrence whenever possible. Otherwise, understand the scene through video film, photographs, sketches and textual description of the investigating officer.
4. Carry out the post-mortem examination in the mortuary only.
5. Ensure no fingerprinting or embalming is done before the post-mortem examination. Important trace evidence can get lost and the artefacts introduced. They mislead.

6. Ensure the collection and protection of the trace evidence (GSR, paint, smears, stains, hair, fibres, dust and other traces.) while transporting the body to the mortuary.
7. If the hand(s) of the victim bear evidence: hair, fibres, glass pieces, stains or other traces cover the hand with clean paper or preferably with a clean plastic cover.
8. X-ray the body (relevant body parts) before starting dissection for locating any foreign bodies or fractures.
9. Photograph all the injuries (abrasion, contusions, punctured or incised wounds) before and after cleaning them, along with a scale and identity chit.
10. Ensure that medico-legal expert himself take off the clothes from the person of the deceased.
11. Examine the clothes as part of the post-mortem examination. Ensure their identity through identification marks.
12. Recover all evidentiary clues, on the person of the deceased.
13. Use simple terminology even when discussing technical aspects of the evidence.
14. Record the negative evidence also. It may look apparently inconsistent with the main findings but later may prove invaluable.

23.2.3 Examination

A post-mortem examination in a murder case provides sufficient evidence to link the criminal with the crime. The steps involved in the examination are:—

23.2.3.1 General examination

- Fix the age, sex, race, body build, and height.
- Describe any deformities, oddities, scars, old injuries, tattoo marks, moles.
- Describe clothes: their number, nature and the evidence (tears, holes, stains, smears) thereon.
- Link the holes, tears, abrasion on the clothes with the injuries on the person of the deceased.
- Locate collect and preserve all the evidence found on the person of the deceased including that found on the clothes.
- Pack them only after drying, if they are wet.

23.2.3.2 Body examination

- Observe and describe the degree and extent of lividity and *rigor mortis* found in the body or in part of the body thereof, if any.
- Observe and describe any oddity on any part of the body.
- Observe and describe signs of asphyxia, if any.
- Describe dental/denture condition.
- Describe the existence of any disease, surgical intervention, which could have contributed to the death of the deceased.

- Locate any defence injuries.
- Record all the negative (inconsistent with the main hypothesis) evidence also.

23.2.3.3 Handling injuries

- Observe and record all the major or minor, internal or the external injuries.
- Observe and evaluate a firearm injury from the site of entrance and describe the wound of entrance, the internal track and the lodgment site or the exit wound in detail. Give serial numbers to each injury.

The description should contain (whenever possible):

(a) The possible nature of the weapon
(b) The presence or the absence of the GSR
(c) The direction of fire, with deflection, if any
(d) The condition of the projectile: Whole? Deformed? Fragmented?
(e) The presence or the absence of any extraneous matter on the projectile from the intermediate target or from the ricocheting surface
(f) Describe site(s) of the injury without using medical terminology

23.2.3.4 Documentation

Log all collected information through:

(a) Photographs
(b) Sketches
(c) Exhaustive description
(d) X-rays, for bone damage

Note.—the evidence on clothes of the victim is logged in the same way.

23.2.3.5 Internal examination

Internal examination involves checking of all the major body organs, cavities, bones for injuries, the extent of damage, decapitation, defects. The examination should be systematic and properly documented. Usually, the departments have forms prescribed for recording the observations. The body parts, observed invariably, are:

- Head
- Neck
- Respiratory system
- Cardiovascular system
- Gastrointestinal system
- Reproductive system
- Urinary tract
- Panaceas, spleen, adrenals, biliary tract

These organs are examined not only for injuries but also for any abnormality or disease. If nothing abnormal is noticed, their absence is recorded. Usually, the letter NAD (Nothing Abnormal Detected) is used for the purpose.

23.2.4 Toxicological Material

In cases of deaths where the cause of death is properly established, the toxicological examination is not necessary. However, in certain cases where the cause of death appears fake, to divert the attention of the authorities or where no other definite cause of death is established, materials for toxicological examination is collected. As a matter of routine the following materials are collected and preserved:

- **Clothes**
- **Stains**, if any.
- **Blood**: it is the most important autopsy material. About 500 ml blood is collected from artery/vein/heart.
- **Urine**; it is the second best toxicological material collected in an autopsy. The total amount of urine in the bladder is collected.
- Vitreous fluids.
- Stomach contents: Whole
- Intestines with contents 30 cm
- Liver containing gall bladder with its contents 100 g
- Kidneys Half of each kidney
- Spleen Half in adult and whole in children
- Bile
- Lung (in cases of volatile poisons) Tied at the open end

The following materials are also helpful:

1. Brain Whole
2. Lung One
3. Heart Whole
4. Muscles 500 g
5. Bone 500 g
6. Hair and nails 10 g
7. Bones, Shaft of femur bone and nails are useful for chronic metal poisoning.
8. Lung, heart and brain are helpful for gaseous and volatile poisons.
9. Muscles prove useful in acute poisoning cases where the body is extensively putrefied. Muscles are resistant to putrefaction and are not easily decomposed.

   Hairs have acquired tremendous importance as a clue source not only for DNA profiling but they are used extensively for identification of drug addicts and alcoholics.

23.2.5 The Opinion

The opinion of the medico-legal expert is the brief conclusion of the observations and inferences. It contains the main information:

- Cause of death
- Mode of death
- Time of death

The medico-legal expert may have to supply additional information on demand.

23.2.6 Post-mortem Report (PMR)

The post-mortem findings are not only important to the prosecution but they are equally important for real justice delivery. The post-mortem report is written on a standard comprehensive form. However, the expert furnishes additional information/clarifications on demand.

There is ample scope to improve the PMRs. A Better description, better illustrations, and more photographs and less use of technical terms can go a long way to make the PMRs common man savvy. The coming up trend to prepare a video clip should prove of immense help.

23.3 MURDER, SUICIDE OR ACCIDENT

The criminals often try to dub a murder as suicidal or accidental death. To identify the nature of death, therefore, is an important medico-legal problem. The expert has to study the total evidence, which includes:

- Examination of the crime scene,
- PMR of the body,
- Signs of struggle at the scene, on the person of the deceased; or, on the body of the culprit,
- Eyewitness accounts,
- Nature of the weapon(s) used,
- Video-film, photographs, sketches and textual description of the occurrence and of the scene,
- Side information, if any.

23.3.1 Homicide

The following evidence indicates homicide.

1. Attempt to hide the corpse
2. Attempt to dispose of the body
3. Absconding of the suspects
4. Manipulation of physical evidence to make it look like a suicide or accident
5. Absence of weapon of offence
6. Creation of fake scene
7. Motive: financial gains, enmity, rivalry or land disputes
8. presence of non-accidental/non-self-inflicted injuries.
9. Presence of self-defence injuries

23.3.2 Suicide

Fig. 23.2

Position of weapon and other articles vis-a-vis the victim in a suicide case can ofIten reveal whether the suicide is real or fake. In this case the facts (firearm in hand without cadaveric spasm) location of bullet and blood inside a rolled carpet went against the theory of suicide

The following evidence indicates suicide:

1. **Genuine suicide note**; about one-third persons committing suicide leave suicide notes.
2. **Previous attempts**; at suicide indicate suicidal tendencies.
3. **Extreme depression;** due to physical pain (illness), emotional problems, fear, quarrel, financial loss may lead to suicide.
4. Certain sites are predominantly used by suicides for self-inflicted injuries. For example, with firearm, temple, forehead, mouth and chest are the favourite sites. With knife cutting of throat and wrist are the favourite sites. Hesitation injuries are also observed in some suicide cases.
5. The person may use more than one method to commit suicide. For example, when a suicide fails to use a knife successfully, he may succeed to hang himself to death.
6. Certain modes of suicides are favoured. Usually, they are less painful and easily accomplished. For example, hanging, sleeping drugs, opium, are quite frequently used.
7. Presence of weapon at the prone position may suggest suicide.

23.3.3 Accident

The following points indicate accident:

1. The source and cause of the accident should be near the victim
2. Death not due to suicide/homicide
3. Tell-tale physical evidence at the scene or with the victim
4. Absence of natural cause: disease, Act of God and the like
5. Absence of struggle/violence
6. Absence of defence injuries

23.4 IDENTIFICATION OF DEATH

What is death? Death is the cessation of life. Life in an individual is sustained by the functioning of the brain, heart, and lungs. If these three body parts stop functioning, the person dies a somatic death. The body parts take some time to become inactive. When they become inactive, the person is said to suffer 'molecular' death.

In most of the cases, identification of death offers no problem, for example, when the head is found severed from the body, death has undoubtedly taken place. However, in some breathing/heartbeat become too feeble and mislead. For example, drugged persons, drowned persons, persons suffering from electric shock or snake-bitten persons may give the impression of death. One has to be cautious. In all such cases, a medical officer must check the victim. The following signs guide n most of the cases:

1. ***Breathing.***—The clouding of a mirror placed before the mouth-nose of the victim, may indicate life.
2. ***Pulse.***—Pulse detection is a sure sign of life. However, the converse is not true. Non-detection of pulse even for half an hour may not mean death.
3. ***Eyes.***—The eyes should react to strong light. On death circulation of fluid stops, tension of the eye muscle is lost and clouding of the cornea appears.
4. **Strong painful stimuli**; they make the muscles of a live person twitch but not that of a dead person.
5. ***Plasticity of body tissues.***— The skin, flesh, lose elasticity and tension. On pressing, flattening take place.
6. **Incised wounds**; they do not gape on dead bodies.
7. **Brain Death**; artificial respiration and other means to prolong life have added a new dimension to the concept of death. When does a man die? When a person fails to respond to the above mentioned tests, he can be considered dead for all practical purposes. But under external stimuli, a person may respond to some of the above tests and yet he may be dead. The death, therefore, is identified when the brain stops activity. The brain remains active even when a person is sleeping or unconscious. The activity stops only when he dies.

   The brain activity is detected by a machine called Electroencephalograph (EEG). If the brain remains inactive for a number of hours (6 hours), the subject is considered/ declared dead.

   Another sure test is to check the circulation of fluids in the brain (cerebral circulation) by injecting radioactive isotope-tagged chemical. If the brain shows no circulation for ten minutes, the subject is dead.

8. **Other Signs of Death;** they include:
   - ***Cooling of the body.***—Body soon after the death cools down and acquires the temperature of the surroundings.
   - ***Lividity.***—Due to non-circulation, the blood accumulates in the lower parts of the body (which are nearest to the earth), giving staining to those parts. – The phenomenon is called lividity.
   - Rigor mortis.—It is the stiffening of the body after death. It starts soon after death (about 4 hours) and continues for a considerable period.
   - ***Putrefaction.***—The bacterial growth in humid and hot climate starts putrefaction of the body. It is the sure sign of death, but it is too belated to be of any forensic significance to identify death.
   - ***Miscellaneous.***—Mummification, adipocere formation, skeletal formation are signs which appear only after long periods.

23.5 TIME OF DEATH

The determination of the time of death is seldom accurate and therefore, never reliable. It may help in some cases, but in others, it can mislead.

> *In a case of death of an infant, the body was found floating in a plastic bag in the sea. Post-mortem examination gave the idea that the body of the infant was in water for 2-3 weeks. Later investigations revealed that the body was in water for 24 hours only. It had been kept in lye previously. (CH)*

Various changes take place in the body. They help to estimate the time of death. These changes depend upon the following general factors:

1. Temperature,
2. Humidity,
3. Supply of oxygen,
4. The state of health,
5. The cause of death,
6. Environments.

As can be imagined, these conditions vary widely in each case. The estimate of time of death, therefore, can always be a rough estimate at best.

Dogmatic assertions of the time of death should neither be expected from seasoned experts nor accepted. However, the following changes in the body indicate the time of death.

23.5.1 Cooling of Body

A lot of work has been done to determine the time of the cooling of the body from normal (rectal) temperature (98.6°F) to the temperature of the surroundings. A large number of formulas have been given, a simple one is:

$$T_e = \frac{T_b - T_r}{R}$$

T_e = Time elapsed since death
T_b = Normal body temperature (98.6 F) or (37°C)
T_r = Temperature of rectum (O_F or O_C)
R = Rate of fall of temperature per hour

23.5.2 Chemical Changes

A number of chemical changes have been studied. For example, variations of potassium content, ascorbic acid, succinic dehydrogenase have been studied. However, the inconsistency of the results does not permit proper estimation of the time.

23.5.3 Lividity

Livid stains appear on the lower parts of the body in 0.5 to 2 hours after death and are completely developed in 6 to 12 hours. Lividity is hastened by lingering deaths.

If the body position is changed frequently, lividity does not develop.

23.5.4 *Rigor Mortis*

Stiffening of the body in most of the cases starts after about 4 hours and is completed in about 8 hours. In some cases, it may take even up to 15 hours to complete.

Cold and poisons delay the appearance of *rigor mortis* (Examples, arsenic, mercuric chloride).

High pressure, temperature, certain alkaloid poisons (example: Strychnine) and certain diseases hasten the onset of *rigor mortis*.

The *rigor mortis* wears off in about 36 hours, though in some cases it may continue even after 48 hours. In others, it may wear off in 20 hours. Roughly the time taken for developing complete *rigor mortis* is equal to the time for which the *rigor mortis* stays. The same time is taken by the body to wear off the *rigor mortis* as taken for development.

23.5.5 Decomposition or Putrefaction

Decomposition of the body passes through various stages which may indicate roughly the time of death. A number of factors such as temperature (ideal temperature 20 – 40°C), humidity, the health of the victim, the surrounding conditions affect. Likewise, the mode of death is also important. Arsenic, antimony, mercury chloride poisonings delay decomposition of the body. Certain diseases hasten the process.

Internal bacteria are mainly responsible to start the decomposition but external bacteria may invade the body and hasten the process.

Climatic conditions in India vary so much, not only at different places but even at the same place in different seasons, that it is difficult to generalise the decomposition stages. However, the following may act as a rough guide:

1. **Abdomen swelling:** starts in about 24 hours and acquire greenish tinge which spreads to the whole body in about 48 hours. The body also starts emitting a foul smell.
2. **Bloating:** After 2-3 days, blisters containing reddish fluid appear. Simultaneously body cavities are filled with gas. The pressure becomes excessive. Fluid comes out from the body orifices (openings: nose, mouth, rectum, vagina and wounds). Sometimes stomach bursts, but this is rare.
3. **Disintegration:** of body fats and proteins also start. In about 1-2 weeks, skin, hair, and nails are loosened. Brain, liver, kidneys tissues soften and disintegrate and liquefy and flow outside the body. In 4-8 days maggots in the corpse develop into pupae and in 6-12 days they change into flies.

Fig. 23.3

Maggot infested body was found in a secluded hut. only maggots could give idea about the period of death

4. **Adipocere formation:** it takes place in bodies which receive plenty of moisture (bodies under water or in a swamp). The formation is due to the hydrolysis of the body fats to fatty acids which preserve the body tissues. Adipocere formation ordinarily takes 3 to 6 months but under hot and humid conditions it may take even less than a month. Adipocere may be partial or complete. Often it is partial.
5. **Mummification:** it takes place in dry and hot climates. The body is dehydrated by evaporation of the moisture by dry hot air. Complete dehydration (and hence mummification) may take about three months to one year. Bodies suffering from a loss of body fluid prior to death are more prone to dehydration and may take less time for mummification.
6. **Bones change slowly**: they lose organic matter first. They become brittle in consequence. Further, changes involve the complete destruction of soft bones and rarefaction of tough bones. Skull and teeth are destroyed last.

23.5.6 Miscellaneous Factors

Some factors, other than body changes, also help to ascertain the time of death:

- ***Watch and Clocks***

  If the victim was wearing a watch and if it stopped functioning due to damage in the scuffle, it can indicate the correct time of the scuffle and, therefore, possible time of death.

- ***Bladder Contents***

  If a person has been killed in sleep, the bladder contents may give some idea about the time of death. The empty bladder may indicate death soon after sleep whereas a full bladder may indicate death in the early hours. Urine continues to get accumulated in the bladder during sleep.

- ***Stomach Contents***

  Undigested or semi-digested food can fix the time of death if the time and contents of the last meal are known. However, caution has to be exercised. Sometimes the digestion stops due to shock, injury or disease.

- ***Clothes***

  The state of clothes on the person of the victim may indicate the time of death. Cotton clothes are destroyed in about 2 years, woollen clothes in about 4 years and silk clothes in about six years. However, climatic factors and extent of use change the time table.

  Ants and other insects can change the time table completely.

- ***Vegetation***

  If the body has been lying in secluded jungles and vegetation has grown through the skeleton, the death is roughly as old as the age of the vegetation at the site.

- ***Rusting***

  Iron and steel articles, such as keys, rings, nails rust. If such articles are found on the skeletal remains of the deceased, the extent of rusting may give a rough idea about the time of death.

23.6 CAUSE OF DEATH

A person may die of poisoning, shooting or in road accidents. The modes of deaths have already been discussed. Additional causes of death include:

23.6.1 Mechanical Violence

Mechanical violence causes internal and external wounds causing dissolution or discontinuation of body tissues. The 'wounds' embraces a wide variety of injuries.

A wound may involve skin, flesh or bones, individually or conjointly. A wound may be simple, grievous or fatal.

Wounds are classified as:

- Abrasions, grazes, or lacerations
- Bruises or contusions.
- Punctured wounds, and
- Incised wounds.

23.6.1.1 Abrasions

Abrasions are caused by the sliding motion of an object or of the body due to scratching or rubbing of the skin against the rough surfaces such as floors, walls, stones, trees, wooden pieces, rope, string or any other hard and rough surface. The shape and size of the abrasion

vary tremendously. It roughly takes the shape and size of the abrading surface on an extended scale due to sliding contact. In abrasions, ordinarily, only the epithelial layer is involved. The injury heals in about two weeks' time without leaving a scar. If however, deeper tissues have been injured due to deeper scoring a permanent scar may be left.

Abrasions are also known as lacerations or grazes.

23.6.1.2 Bruises

Bruises are also known as contusions.

Bruises are caused by an impact of a blunt weapon like a lathi, club, stone, hammer, shoe, fist, foot or a knee on a body. The impact crushes subcutaneous tissues, rupturing small blood vessels and tearing flesh. Often painful swelling appears at the site.

Bruises are, ordinarily, simple injuries. They prove sometimes fatal when some bones or internal organ is crushed. An injury to head, spinal cord or to a vital organ like heart or testis may cause death.

The shape and size of a bruise correspond to the shape and size of the weapon of offence if the bruise is examined immediately after the impact. Later, the bruise spreads over. It is often not possible to identify the nature of the weapon from the examination of the bruise alone.

Bruises may be accidental, homicidal or self-inflicted. It is often difficult to differentiate between them.

Fig. 23.4

Stab wound in the heart region proved fatal

23.6.1.3 Punctured Wounds

Punctured wounds are caused by pointed and sharp edged weapons like knives, spears, swords, spikes, sickles, and axes. Nails, glass fragments, stones, and firearm projectiles may also cause such wounds.

Punctured wounds have greater depth than length. Outer dimensions of the wounds are ordinarily smaller than the instrument causing the wound.

Fatal punctured wounds, other than firearm injuries, are often rare. They are often homicidal in nature.

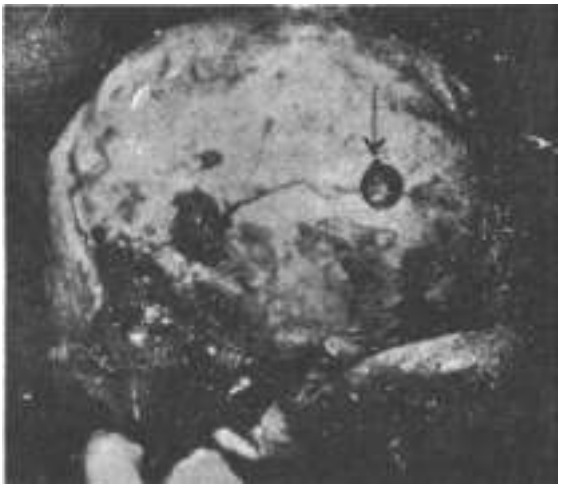

Fig. 23.5

The shape of the injury can some time be misleading. The injury indicated by arrow-head looks like a bullet injury. it was in fact a road accident injury

23.6.1.4 Incised Wounds

Incised wounds are caused by sharp-edged weapons and have clean cut edges. They have a greater length than depth.

Some wounds prove fatal because of:

- Haemorrhage.
- Effusion.
- Shock.
- Complications

Haemorrhage (excessive bleeding) may drain off most of the blood and leave insufficient blood in the body to provide oxygen to various organs especially the brain.

The minimum quantity of blood which must be lost to cause death varies according to the health and age of the victim. The blood continues to flow for sometimes even after death if the wound is large in a prone position. The quantity of blood in a pool is not, therefore, true index of the fatal loss, it may indicate the time of injury in other cases.

The rate of loss of blood varies with the passage of time. It becomes less and less due to clotting and fall in blood pressure.

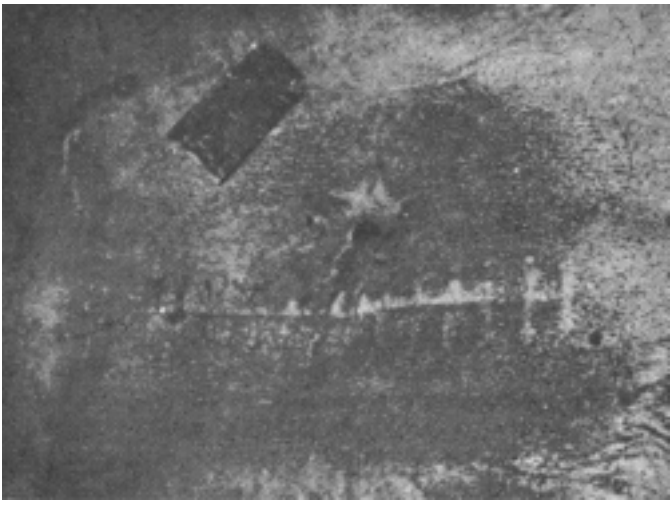

Fig. 23.6

A stab wound was treated in a hospital for a few weeks. Ultimately, the victim died. Does survival for a length of time infer diminished responsibility on the culprit?

23.6.1.5 Miscellaneous

- ***Effusion:*** It is soaking of internal body tissues with blood. If blood effuses into vital body organs such as brain, throat, lungs or heart, it stops their functioning and death ensues.

  Sometimes the wounds causing effusion are not visible, yet they prove fatal (for example head and chest injuries).
- ***Shock:*** It is the fall of blood pressure due to fright or unbearable sight. It may cause death. There may or may not be any mechanical injuries.
- ***Complication:*** Injuries, sometimes, in themselves, are not sufficient to cause death. But they bring in complications in the body functions and cause death. A non-fatal injury may incapacitate a person from moving about. Heat, cold, exposure, hunger or thirst may then kill the victim. The victim may be already suffering from some ailment which is accelerated by the injuries and bring about death. Negligence in the treatment of the injuries has caused many deaths.

  The culprit claims diminished responsibility in such cases, the medico-legal expert should appraise the claim, whenever possible.

23.6.1.6 Dimensions of Wounds

The apparent size of a wound may be smaller than the size of the weapon/projectile causing it. This is due to the elasticity of the skin. The thrust/penetration of the weapon/projectile into the body, stretch the skin When the weapon/bullet leave the site, the skin acquires normal position and assumes smaller dimensions of the wound. This is noticeable, particularly in punctured wounds.

If the weapon is rocked inside, the size of the wound may be larger.

Fig. 23.7

A sword attack or the head cut through the skull, injuring brain resulting in immediate death. the cleavage is seen clearly in the radiograph.

In gaping wound, the width of the wound is larger than the thickness of the weapon. Theelasticity of the skin is responsible for the 'gaping effect'. It is observed in incised wounds.

The dimensions and nature of the edges of a wound may give some idea about the nature of the weapon.

23.6.1.7 Age of Wound

It is not possible to determine the exact age of a wound but a rough idea may be formed from the following factors:

- There is a gradual change in colour of bruised skin. The skin first becomes red and then blue. The colour then starts fading. The time of disappearance depends upon the force of impact, the position of the bruise on the body and the age and health of the person. In some cases, blood clots, do not get dissolved and give permanent blue-black colour unless the same are mechanically removed.
- Inflammation and pus formation may give some idea about the age of the wound.
- Healing scars indicate the age of a wound.
- Formation of callus in bone fractures is a useful indication of the age of the injury. The formation is soft to start with. It hardens with the passage of time.

23.6.1.8 Ante or Post-mortem Wounds

Ante-mortem and post-mortem wounds are distinguished from the following features of the injuries:

- Wounds inflicted on living tissues inflame and heal. Dead tissues putrefy. The difference is noticeable.

- The skin loses its elasticity after death. Therefore, the changes associated with the elasticity of the skin; do not take place when the wound is inflicted on a dead body. However, wounds inflicted immediately after death, may look like ante-mortem wounds.
- Post-mortem wounds do not bleed unless some important vein is cut or the wound is inflicted in a place where blood had accumulated by gravity and flows out from the wound due to gravity. Such bleeding is distinguished from the usual bleeding by the absence of spurting and formation of fibrin (clotting). Spurting and clotting of blood take places only in ante-mortem injuries.
- Blood coagulates in about 12 hours after death. If a wound is inflicted after this interval there will be a very little bleeding.
- The edges of the wounds are deeply and firmly soaked in ante-mortem injuries.
- Bruises cannot be caused on a dead body after a few hours of death. However, sometimes, bruises appear after death for injuries inflicted during life time.

23.6.1.9 Fatal Wounds

It is of great forensic importance to establish whether a particular wound is by itself or principally responsible for the death of the victim. This is established through a detailed and thorough autopsy and study of the medical history of the victim. Certain diseases like weak heart, tuberculosis, asthma, and haemophilia accelerate deaths. Victims suffering from these diseases succumb to violence more easily than normal healthy persons.

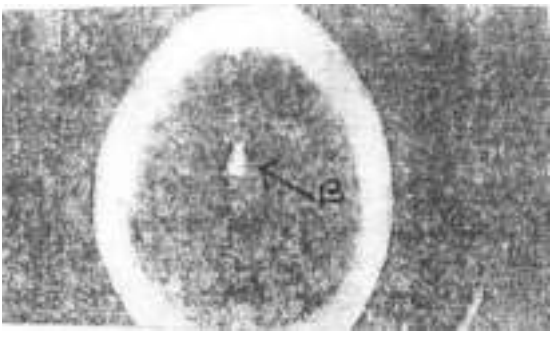

Fig. 23.8

Alive and kicking, even with a bullet (B) in the brain for the last seventeen years. impossible medically?

23.6.1.10 Incapacitation

It is frequently asked whether a victim after receiving a certain injury or injuries could perform the given acts. The medico-legal history is replete with fantastic tales of activities carried out by the injured victims who later collapsed and died.

It appears the will power of the individuals, which vary tremendously, mainly accounts for the unbelievable acts sometimes performed by the injured victims. Ordinarily, any serious injury to a vital organ should incapacitate a person immediately.

23.6.2 Asphyxia

Asphyxia, commonly referred to, is by mechanical means. But it is a many splendoured Phenomenon and includes suffocation, choking, strangling, hanging, drowning and crushing of the heart and lungs.

Asphyxia means the non-supply of oxygen to the body. It may be achieved by chemical or mechanical means.

If the air inhaled contains very little oxygen, as in rarefied atmosphere at high altitudes, or in the air mixed with gases like carbon dioxide and nitrogen in large amounts, asphyxia results. Carbon monoxide or hydrogen cyanide combines with and inactivates haemoglobin, the oxygen carrier in the blood, and causes asphyxia. Certain drugs like opium, inactivate the heart and prevent the supply of oxygen to body parts by restricting the blood circulation, with fatal results In all these cases it is asphyxia.

23.6.2.1 Identification of Asphyxia

Asphyxial deaths are identified from the following observations:

1. Skin becomes pale. Minute droplets of blood may ooze out on the facial skin.
2. Eyes become bloodshot. Pupils become dilated. The eyes remain partially open. If a section of the eye flesh is examined, it shows minute droplets of blood.
3. The mouth remains partially open. Tongue may protrude. Froth is found in mouth, nostril, throat and windpipe.
4. Blood is deficient in oxygen.
5. Marks of violence are found on the body. The nature, number and the position of the marks depend upon the mode of asphyxiation. A person dies in about five minutes from asphyxia.

23.6.2.2 Suffocation

If the inlets of air supply, mouth and nose, are blocked from outside, suffocation (asphyxia) takes place. This is achieved manually by placing hands over the inlets or closing them with a piece of rag or cloth. If the head is buried in a heap of floor, sand, earth, mud, grains, coal dust, snow, water, cotton and wool, asphyxiation takes place.

Suffocation is generally accidental or homicidal, though it can be suicidal.

Accidental suffocation may kill children, drunkards or person suffering from epilepsy. They may bury their heads in pillows, mud, snow or a heap of flour or dust and die.

Homicidal suffocation may carry bruises around the nose and lips as the victim struggles for release.

Being buried alive, accidentally or otherwise, is a form of suffocation. It is ascertained by the presence of foreign matter inside.

23.6.3 Choking

Choking is another variation of suffocation/asphyxia, where the inlet passage of air supply is blocked internally.

Choking may be accidental or homicidal.

Accidental choking may occur when something like a marble or a lump of food is swallowed and gets stuck in the air passage.

A few decades ago, the Chief of Indian Air Force died in Japan due to choking. A piece of meat had stuck in his throat, which choked him to death. (CH)

In homicidal choking, a piece of cloth or other material is pushed through the mouth deep into the throat. The intention of the culprit may not be murder. He only wants to silence the victim but death may follow.

23.6.4 Strangulation and Throttling

Strangulation involves constriction of the neck muscles. The air passage is blocked and the victim dies. Constriction of the neck is caused by an external force. Hands, or a cord, a string, a rope or a piece of cloth may be used.

The neck is marked where the skin is pressed. The skin becomes soft and red. The marks take the shapes of the item used for strangulation.

The death is caused by asphyxia. The neck muscles, arteries, and bones are also damaged. There may be bleeding from the nose and the mouth.

Suicidal strangulation is rather rare and may be accomplished only by lunatics. Accidental strangulation is sometimes possible. Strangulation is generally homicidal. Sometimes it is preceded by drugging.

Throttling is strangulation where only hands and fingers have been used to put pressure on the throat.

23.6.5 Hanging

Fig. 23.9

Hanging death is possible even from insufficient heights. Even if a part of the weight is transferred to the hanging rope or other device, the man loses life

Hanging, like strangulation, involves constriction of the neck. The body is hung by the neck through a cord, string, rope, wire or a piece of cloth. No external force is applied. The weight of the body alone is sufficient to cause death through asphyxia. Damage to neck tissues and arteries and dislocation and fracture of vertebrae may take place, especially in judicial hanging.

> *A corpse was recovered in advanced stage of decomposition. Death due to exposure to elements was suspected. However, fracture of the vertebrae was noticed at the time of post-mortem examination. The case was investigated as a murder. (CH)*

Ligature marks found around the neck on the side opposite to the knot indicate hanging. Detailed examination reveals signs of asphyxia and damage to neck tissues and sometimes to bones.

Hanging is identified from:

1. Dribbling of saliva from the mouth.
2. Elongated neck.
3. The base surface of the groove parchment like.

Hanging was one of the commonest methods for suicide in India. Accidental hanging, though rare, is possible. Homicidal hanging to simulate suicide is frequent. Even dead bodies are 'hanged' sometimes. They may carry the ligature marks but signs of asphyxia are absent.

23.6.6 Drowning or Submersion

Drowning causes asphyxia, though other complications such as dilution and laking of blood, exhaustion, heart failure, hitting against some rock-like hard object may also take place. Persons are known to have died even in shallow waters (or other fluids). Presumably, the victims were too feeble (due to intoxication, drugging, injuries or diseases) to save themselves.

Drowning is recognised by both internal and external changes. Signs of asphyxia, foreign matter in hands, mouth, and inside, abrasions on fingers, toes, knees and forehead and vomitus constitute external signs.

Internally, froth mixed with blood and sometimes with food matter in the windpipe, foreign matter along with water in the stomach, haemolysis of blood and distention of lungs (with frothy bloodstained fluid) and stomach are observed. Identifications of diatoms in body fluids are a reliable test for drowning.

If the body is submerged under water for a long time, the hands and feet acquire 'washerman's skin' and lungs are swollen and congested.

Drowning is often accidental and suicidal; it is rarely homicidal. It is often difficult to decide whether the drowning is homicidal or not. Answers to the following questions help:

1. Is the body tied? If so, it is, ordinarily, homicide. The rope with the knots is preserved. It may virtually tie the culprit with the murder.
2. Are there any homicidal tears, holes, stabs or stains on the clothes of the victim?
3. Are there some injuries on the body? If so, were they present before the body was submerged? Or, are the injuries due to falling in the water and striking against some hard object under water or en route?

4. Are there any fractures or dislocations of bones, bullets or other foreign matter in the body? Could the damage to bones occur inside water due to fall and striking against some hard object?
5. Does the viscera contain poison? The presence of poison indicates either homicide or suicide.
6. Was the deceased of sound mind? Did he have a tendency towards suicide or did he suffer from some disabling disease like epilepsy?
7. Who was interested in his removal?

Sometimes dead bodies are thrown in water for disposal by the murderers. The bodies do not show any signs of asphyxia and there is no foreign matter including water in the bodies.

23.6.7 Miscellaneous

Miscellaneous causes of death include starvation; electrocution; cold and heat. It is often difficult to determine whether the death due to these causes was accidental, suicidal or homicidal in nature.

23.6.7.1 Starvation

Starvation deaths were common previously due to recurring famines. They are very rare now. Starvation deaths are identified from the following:

1. Hollow and shrunken face
2. Absence of fat and muscles
3. Disagreeable odour
4. Loss of body weight
5. Bowls become translucent
6. Excretion track carries a hard crust of stool
7. Shrunken heart, lungs, spleens, pancreas and kidneys
8. Very little blood in the body

23.6.7.2 Electrocution

Deaths due to electrocution are increasing with the increasing use of electricity. They are often accidental and rarely homicidal or suicidal.

A current under 250 volts is considered safe but deaths have occurred even with a current of 50 volts or so. The body built, the clothing and the atmospheric conditions have an important effect.

The electric current affects the heart, brain, and respiratory centres to cause death.

Death due to electrocution is identified from the injuries. There are burns at the point of entry and at the point of exit and reddening en route. If the current has passed through a metal object in its passage, there is burning of the skin at the point. Sometimes there are no visible injuries.

Accidental electrocution takes place due to defective electrical appliances or exposed naked electric points or wires.

Fig. 23.10

Fig. 23.11

Fig. 23.12

Electric burns were found both on chest (Fig. 23.10) and on back (Fig. 23.11). But they did not look so severe. When the body was subjected to post-mortem it was found that even the bones had burnt (Fig. 23.12)

23.6.7.3 Lightning

Deaths by lightning are rare in India. When the static electricity of clouds is discharged with a flash, a high voltage current is generated. It destroys anything in its passage including trees, buildings and individuals.

There are extensive injuries: burning and shredding of flesh. Fractures and dislocations of bones of the body also take place.

Fig. 23.13

Lightning deaths are rare in india, multideaths are rarer still. Yet half a dozen persons were killed when lightning struck the tree under which they were standing

23.6.7.4 Cold

Deaths due to cold are generally accidental. However, infants, children and old people are sometimes exposed to cold deliberately.

The effects of cold vary from simple reddening of exposed parts to their complete elimination due to frostbite when the skin temperature is around -10°C. Physical changes in the heart, lungs, and brain give significant indications. The exposed parts (fingers, toes, ears, nose) are severely affected.

23.6.7.5 Heat

Persons working near hot object, like engines or boilers, perspire heavily. They suffer from heat cramps and may die of exhaustion. Persons working in a hot climate or in closed areas may die similarly.

Heat radiations also cause sun strokes which damage the brain with fatal results.

23.6.7.6 Scalding

Hot fluids, when thrown upon a person, produce scalds (blisters). They sometimes prove fatal mostly due to extreme pain and shock.

23.6.7.7 Burning

Fig. 23.14

Pugilistic pose of a burnt body of a woman. Scalds on face. Scalds on the belly can be easily discerned

Heat, ultraviolet rays and X-ray radiations produce burns. The damage to the body tissues depends upon the source of energy, the length of exposure and the health and the part of the body exposed.

Deaths due to burning are generally accidental. The clothes of the victim may catch fire, a kerosene oil stove may burst or an individual may get surrounded by a big fire. A painful death ensues.

Bride burning has acquired unfortunate proportions in India in recent times. Usually, kitchen accidents are simulated even for murderous burnings. Proper examination of the scene and other evidence helps to discriminate between accidental and homicidal bride burning.

Table 21.1

Ante-mortem/postmortem burning Signs

S No	Evidence	Ante-mortem burns	Post-mortem burns
1	Redness line(s)	Present	Absent
2	Blisters	Blister with serous fluid. Base inflamed	Blisters with watery fluid. Burst easily. Dry base.
3	Vital reaction	Present	Absent
4	Enzymes	Increase in enzyme activity	Does not show
5	CO-Hb	Carboxyhemoglobin > 5% or more. 10 % common. Blood colour change to cherry red	less
6	Soot	Present	Present: passive intake in some

A criminal sometimes sets a house on fire and burns a dead body to simulate accidental burning. However, post-mortem and ante-mortem burns can be distinguished. The latter contain fluid in the scalds and there is inflammation of the skin around the burns. These signs are absent in post-mortem burns.

23.7 MEDICAL NEGLIGENCE DEATHS

The occurrence of deaths and damage due to medical negligence are increasing in India. The aggrieved persons are now filing suits against the doctors for negligence. The number of such cases is increasing.

Medical negligence has been defined as an action, on the part of the doctor, to omit to do something what is normally required to do for the treatment of his patient or to do something, which is harmful to the patient resulting in injury or death to the patient.

Medical negligence includes professional negligence and malpractices, like taking out body organs clandestinely, on their part. It also includes lack of skill, wilful negligence and carelessness on the part of the doctor.

Medical negligence becomes legally actionable when the patient suffers damage, may be immediate or delayed, may be mental or physical, may be financial or it may be affecting the quality of life.

23.7.1 Classification

Medical negligence is classified into two categories:

1. *Criminal Negligence*
2. *Civil Negligence*

Criminal negligence is a gross harmful act, usually resulting in the death of the patient. The police investigate such cases under section 304 A of the Indian Penal Code. The act may also result in serious impairment of the patient.

Other major criminal acts on the part of the doctor involving criminal action are taking out body organs for sale, covertly or otherwise.

> *In a recent case, a gang (at Amritsar and at Jallandhar) would catch hold of persons, intimidate them or promise them with heavy compensation to donate a kidney. The gang member would get them operated to remove one of their kidneys. The subject would not get proper after-operation care and would die or the gang members would kill them to save for themselves the promised compensation. The body would be cremated under a false name. One of the members of the gang, under police interrogation, has admitted of fifteen such cremations. The racket involves not only the gang members but many others also—the doctors, the lawyers and the authorisation committee members, (TOI, 20 November 2002).*

In civil negligence the police are not involved. The affected party sues the doctor for damages. In both cases, he/she has to prove that:

- The doctor was negligent and the damage could not occur but for his negligence.
- He did not perform his duty well.
- The damage to the patient was due to the doctor's failure.
- The patient did not contribute towards the damage.
- The doctor was incompetent.
- The doctor indulged in malpractices.

- He had no regard for human life.
- He showed professional misconduct.

No proof is required if the negligence is self-evidence. Examples:

- Forceps or sponge found inside the victim.
- Two fingers were to be set right; another two also stopped functioning after the operation.

The usual defence taken by a doctor is that the patient or his attendants failed to cooperate, did not follow the suggested treatment or did not attend the treatment schedule as per the advice of the doctor.

Doctor and patient's relationship is that of the implied contract, once the doctor takes up the case, he is supposed to:

- Use necessary care, attention, judgment and skill.
- Use clean and proper appliances. The use of a kitchen knife for removal of piles was condemned by the court in a case.
- Administer proper medicine.

  A doctor gave strychnine in place of quinine. It killed the person. The court held it a case of negligence.
- Give direct intelligible instructions in simple language.
- Continue case until the patient is cured.
- If the disease is beyond his skill he must either consult specialists or refer the case to such specialists or specialist institutions.
- Treat patients while under the influence of liquor or drugs.

23.7.2 Investigator's Role

The investigator's role is a hard task. He has to find evidence, which is often technical in nature. He should proceed systematically. He should procure information about the doctor from his relatives, friends, associate, sub-ordinates, and superiors, other current or previous patients. He should also procure information about death or injury. The following check list help:

23.7.2.1 Death in operation

- Proper record: consent, consultations.
- Proper diagnostic investigation: Biopsy, X-ray, laboratory tests for hypertension, diabetes, drugs in the body?
- Body's adverse reaction to the medicine?
- Haemophilia? ECG?
- Wrong patient, wrong body part, wrong medicine, contaminated drip, incompatible blood transfusion, fat-air embolism?
- Gross negligence: instrument, sponge or swabs inside?
- Cause of death: operational shock, vagal inhibition?
- Criminal wounding for organ theft or otherwise?

23.7.2.2 Post-operational care

Post-operation care is a necessity in most of the cases. Did the concerned doctor take proper care? The check of the following points help:

- Adequate attendance?
- Proper medication/injection at the proper time?
- Plaster too tight, too loose?

23.7.2.3 Anaesthetic deaths

Anaesthetic deaths occur due to negligence, ignorance or lack of proper handling:

- Patient unfit for anaesthesia: under the influence of drug, have sickle cells or heinie infestation.
- Improper dose.
- Basal or wrong gas or ether anaesthesia.
- Prolonged anaesthesia: a person with weak hearts may suffer heart attack.
- Faulty relaxants.

23.7.2.4 Malpractices

Has the doctor indulged in malpractices? The following are common malpractices:

- Theft of body organs?
- Unauthorised termination of pregnancy?
- Foetus sex test
- Experimental transplantation or use of new drugs and medicines

The investigator has to get the help of experienced doctors, both to carry out the post-mortem examination and to understand and prove negligence or other failures on the part of the doctor. He may not succeed alone in many a case.

23.8 IDENTIFICATION OF THE DEAD

The identification of the corpse is necessary to establish the *corpus delicti*. It is done through:

23.8.1 Relatives and Acquaintances

The most reliable identification of a corpse is the one made by relatives and friends. Ordinarily, they do not make mistakes. But when a body has altered greatly, the identity of the deceased should be considered established only if they can indicate specific identification features.

23.8.2 Documents

Certain documents like personal letters, driving licence, passport, permits and receipts may be found on the person of the deceased. They lead to the identity of the corpse.

In some cases, a document may be 'planted' on the deceased to give the corpse an 'identity' which the culprit may desire. The identity, therefore, established from documents should be confirmed from other sources.

A skeleton was recovered from a pit. The flesh and clothes had been completely destroyed by insects. A wrist watch, a steel bangle and a lump of earth suspected to contain a plastic object were recovered. The state of the skeletal remains indicated that the body was lying there for a considerable period. The lump of earth was, therefore, carefully worked to collect its contents. It gave a plastic diary cover containing a crumbled diary, a few coins, bits of currency notes and other papers.

The diary was identified as one issued by a college. The bits of currency notes were found to be at least worth over Rs 600. Some of the bits of paper were suspected to be college fee receipts. Comparison of the writings on one of the bits of paper with duplicate carbon copies in the fee receipt book established original-carbon copy relationship of the documents. The identity of the deceased was, therefore, established.

The recovery of a comparatively large amount of money ruled out robbery or planting of the document to mislead the identity. (CH)

23.8.3 Portrait Parle

The portrait parle of the corpse proves useful. It should be compared with the portrait parle of the suspected deceased or missing persons.

23.8.4 Scars, Fractures, Deformities, Tattoo Marks

The positions, sizes and shapes of scars, tattoo marks, fracture and deformities are helpful.

A fire at the central apartment building in a city recently completely gutted the third floor and heavily damaged the first and second floors of the structure.

An investigation was conducted by the police department and a member of the fire brigade office to ascertain its cause and account for all building occupants. It revealed the fire had originated in apartment 42 and spread throughout the entire third floor. Careless smoking was the probable cause of the blaze.

During their search of apartment 42, badly charred human remains were found in the debris. The remnants of the corpse were taken to the mortuary where a post-mortem examination was conducted. The corpse was so severely charred that identification could not be made by physical appearance, fingerprints or dentures.

All occupants were accounted for except one, a known alcoholic approximately 50 years old, who lived in apartment No. 30 on the third floor and had been seen coming home in an inebriated state about one hour before the fire was reported. It was surmised that the charred remains were his. However, the things that could be established with certainty were: the body was of a male, of the same height and was discovered in apartment 42—not apartment 30. Although this suspected victim was known to wander from apartment to apartment, further identity doubts were formed when another occupant claimed to have seen him leave the building a short time after the arrival of the fire department.

The suspected victim has been known to wear a belt decorated with a World War II medal, the finding of which would assist in identification. In an attempt to locate the medal the pathologist X-rayed the corpse while the police searched the debris. The medal was not found.

The X-rays did, however, reveal that both ankles had previously been fractured. The victim's hospital records revealed similar fractures, comparison of the X-rays of the deceased with those on the hospital file were able to positively identify the body of the suspected victim. (CH)

23.8.5 Professional Marks

A photographer (not a digital photography Worker!), a dyer, a painter, a laboratory worker or a chemist will have stains on their person. A tailor, a draughtsman or a petition writer will have stiffening on his hand. Professional marks reduce the number of possible suspects. Professional dust carried by the deceased is also useful. A colliery worker carries coal particles; a flour mill worker carries flour and so on.

23.8.6 Personal Articles

The personal articles: clothes, shoes, ornaments, a watch, a knife or a pen may carry the name of the manufacturer, the repairer or of the supplier. The clothes may also carry laundry marks.

The shoes carry, in addition, the prints of the feet inside. These prints are compared with similar prints in other pairs of shoes, found at the residence of the suspected victim. They may, thus, help to identify the deceased.

23.8.7 Photographs, Sketches, Casts

Photographs, sketches or casts of modelled features of the deceased should be displayed to the general public. The media of press, police gazette, cinema and television should be used to give wide publicity.

23.8.8 Fingerprints

The deceased may have a fingerprint record. It should be checked. Or, if he has no record, latent prints may be found at his residence. They may identify the corpse.

23.8.9 Dentures

If the deceased has a dental record, it permits the identification of the deceased. The number, nature and positions of the teeth present and lost, peculiarities of arrangement of teeth, crooked, broken, eroded, and additional teeth, presence of bridges and metallic in-lays individualise the denture and hence identify the deceased. Odontology is proving a great help in the identification of the dead persons.

23.9 SKELETAL REMAINS

The evaluation of skeletons and bones is done by forensic anthropologists[2]. They provide a lot of useful information which helps the criminal justice system in many ways:

23.9.1 Human Bones

The structures of certain bones, the jaws, the hands, the feet, and the skull have characteristics, which permit discrimination of human or animal bones. If a number of bones are recovered there is no difficulty to establish the source, but a single old bone may make the task difficult.

Comparatively fresh bones contain organic matter, which gives precipitin reaction with human antisera and thus establishes the human origin of the bones. Through DNA profiling it is now possible to establish eve the identity of the person to whom the bones belong.

2. See chapter "***Forensic Anthropology***."

23.9.2 Number of Victims

It is possible to find out whether the bones recovered in a case belong to one or more than one persons. They are arranged to form a skeleton. If there is no duplication and the bones fit *inter se*, they belong to one individual; otherwise, they come from more than one individual.

Certain bones like vertebrae and mandible are highly characteristic of the human body. They resist decay, fire, and chemicals. There is only one vertebra coccyx in the human body. Their identification and number help to establish the number of victims.

23.9.3 Age of the Victim

The following factors help to determine the age of the victim:

1. **Teeth:** The wear, cement deposit, closing and resorption of teeth, roots and transparency of teeth are helpful.
2. **Roof of Cranium:** The sutures (ossification lines) in the cranium are straight in a young age. They acquire serrated edges and ultimately the lines are covered with calcification. The smoothness and thickness of the surface of cranium are also useful, indicator of age as they change with age.
3. **Ossification of Bones:** The ossification in long bones helps to ascertain the age if the skeleton belongs to a person who had not reached adult age, as it continues from birth to adult age.
4. **Haversian Canal**: The ratio of the internal and external diameters of the Haversian canal of a bone changes with age till the subject has reached adulthood.
5. **Rarefaction of Bones:** Bones rarefy in old age. The extent of rarefaction indicates the age of the victim.
6. **The size, structure, strength** and composition of bone materials of certain bones, especially of fingers and toes, prove helpful to determine the age of the victim.

23.9.4 Sex of the Deceased

It was difficult to determine the sex of the deceased from the bones if only one or a few bones are available. Now, DNA profiling helps

The following bones are helpful to ascertain the sex:

1. Pelvic bone
2. Breast bone
3. Skull
4. Spinal cord

The ratio of the width of shoulders and the hip in general, is more than one in males and less than one in females. Besides, the bones of females are smoother and weaker than those of males.

23.9.5 Height of the Deceased

An idea about the height of the deceased from the skeletal remains is obtained by multiplying the length of a long bone with a suitable multiplication factor. The following factors are useful:

Table 23.2

Long bones Multiplication factors

Humerus	5.2
Radius	6.5
Ulna	6.0
Femur	3.7
Tibia	4.3
Fibula	4.4

The exact multiplication factors vary for males, females and children and for various groups of population. However, the above factors give rough estimate of height in most of the cases.

23.9.6 Identity of the Deceased

The identity of the deceased from skeletal remains is established from the following:

1. **Dentures** of all persons are individual. If the deceased had a dental record, the victim is identified.
2. **Fractures** of bones are individual. The victim may have fractured his bones and the X-rays record may be available. Comparison of the record with the healed fractures may indicate the identity of the deceased.

   A completely charred body was recovered from the debris of a burnt house which was occupied by a single owner. It was suspected that the body belonged to the owner.

   The owner was known to have suicidal tendencies. A few years earlier he had attempted suicide with a firearm. A Radiograph was taken. It indicated several small fragments of projectile lodged inside the body. The fragments were not taken out.

   A Radiograph of the charred remains was taken. It indicated all those fragments in the body at relevant positions. The identity of the deceased was established beyond doubts. (CH)
3. **Deformities** of head, legs, arms and neck are characteristic. They affect the bones. A careful study of the same leads to the identity of the deceased.

   A few years ago, a skeleton was recovered. Its identity could not be established. It was then sent to a medico-legal expert. The expert discovered thickening of the neck bone on one side. He concluded that the deceased had a deformity on the neck. The head hung to one side. The information led to the identity of the deceased. (CH)
4. **Skull** is also used for the identification of the deceased. Identifications from the skull photograph and life size photographs of the suspected victim are made by superimposition techniques. They may indicate the identity or non-identity of the suspect.

   Life size photographs of the head of the deceased and transparency of the skull are superimposed. The positions, of the nose, eyes, ears and chin should correspond. In the case of non-identity, the various positions do not superimpose.

   Three youngsters visited Morni hill, had drinks and drugs. Late in the evening they had an altercation and one of the youngsters was strangulated by the other two. The dead body was thrown in ravines, which are not visited usually by human beings. The skeleton of the body was discovered after a long time. Its identity to that of the boy was established through skull superimposition. (CH)

The following anthropometric measurements of the actual skull, life size photograph and ante-mortem life size photograph of the person are taken and super-imposed *inter se* for a match or non-match:

1. Total face height
2. Face width
3. Upper face heights
4. Lower part face width
5. Nasal aperture; height, width
6. Intra orbital width
7. Orbital height, width.

Seventeen persons were killed in a house collapse in Delhi, a few years ago. It was suspected that vibrations of generator caused the collapse. The bodies of the remnants of 16 persons were identified. The remnants of 17th person remained unidentified. They closed the case after a few months. The intelligence bureau, however, continued to investigate. They found that one of the terrorists was missing from the date of occurrence of this collapse. The intelligence bureau suspected that the terrorist was the 17th dead man in the house collapse.

Skull superimposition technique indicated that the remnants were of the missing terrorist. Presence of RDX in the debris established that the house collapse was due to an explosion, not due to generator vibrations. (CH)

Fig. 23.15

A terrorist who was extensively disfigured in an explosion in Delhi, was identified through skull superimposition technique

In comparison of facial features of ante-mortem life size photograph and morphology of the skull, the following points are measured and compared:

1. Eyebrows
2. Medial margins of the slit
3. Lateral margin of eyes
4. Position of moustache
5. Position of closed mouth
6. Face outline
7. Nasion
8. Position of ear
9. Position of nostrils
10. Height of nose
11. Width of nose
12. Width of mouth
13. Maximum width of the nasal bridge
14. Lip height.

Ruxton case (British) was perhaps the first important case in which the victims were identified from skeletal remains through the superimposition of photographs. The technique proved useful in the differentiation and identification of the two murdered women. The technique has been extensively exploited since its first introduction in that case.

A few years ago, an inmate escaped from a mental hospital. A thorough search of nearby localities proved futile. After about a year, a skeleton was found in a jungle, about 10 miles away from the mental institution. The remains of the clothes indicated that the deceased was an inmate of the mental hospital.

Several patients had run away from the hospital during the past few years. The dental charts were, therefore, checked and compared with the denture of the deceased. The comparison indicated that the deceased was probably the above referred patient.

The exact identity of the deceased was established from a radiograph of the spinal vertebrae taken in the hospital before the patient escaped from the hospital. It tallied with the one taken from the skeleton. (CH)

23.9.7 Burnt Bones

Cremation of dead bodies is the normal way of disposal of the deceased among Hindus. It is also being increasingly used in other countries.

Cremation destroys most of the evidence. However, some parts like teeth may escape destruction. They establish the human origin of the bones. Under favourable circumstances, they may also permit the determination of the identity of the victim.

On burning, the bones lose organic matter. They become brittle and may even be reduced to ash. They leave no substantial evidence. However, the analysis of the ash can indicate that bones have been burnt. The analysis may not differentiate between human and animal bones.

23.10 INFANTICIDE

Infanticide means killing of an infant, a child less than one year old, by acts of omission or commission.

Law does not make any distinction between murder and infanticide in India. The problems of infanticide are peculiar and therefore, need separate treatment. In fact, there is a definite need for separate infanticide laws.

Infanticide was a closely connected crime to abortions for hiding conception and childbirth from sexual intercourses outside wedlock where the child was unwanted. With the liberalisation of abortion laws, this necessity for infanticide has decreased tremendously. Now infanticide is committed only when a doctor refuses abortion for any reason; advance pregnancy age being one of the main causes. Or, a tantric may persuade some ignorant parents or mother to sacrifice an infant.

Property heirlooms are also murdered to grab his property for property. Sometimes an infant is killed for revenge.

23.10.1 Murder

An infant may be killed by acts of commission or omission:

The common acts of omission are:

1. The umbilical cord is not knotted after severing.
2. The infant is not taken out from the mother's discharges.
3. The infant is not protected from the natural elements (heat, cold, rain, wind).
4. The infant is not fed.
5. The child is abandoned at some secluded place.

The infant is killed willfully in the following ways:

1. The infant is suffocated by closing the nose and mouth.
2. The infant is strangulated.
3. The infant is battered, often simulating fall injuries.
4. The neck is twisted.
5. Heart, lungs, liver or head is punctured by needling.
6. The infant is poisoned. Usually, opium is administered.
7. the infant is drowned or buries alive.

23.10.2 Accidental Death

Sometimes the infant dies accidentally:

1. When a mother dies, usually the child in the womb also dies. Only in rare cases, he can be saved.
2. Prolonged labour may compress the infant and kill him.
3. Precipitated (sudden) labour may kill the infant due to fall or drowning in the commode.
4. The umbilical cord may get entangled and strangulate the infant.
5. Some times the infants head is covered with a membrane. It may suffocate the child.

23.10.3 Congenital Defects

In addition to the above, an infant may not survive due to immature birth of the infant, disease, haemorrhage or due to *Rh* incompatibility.

It is unnecessary to go into their details.

23.10.4 Investigator's Role

Investigation of infanticide cases is a delicate task. He must perform the same with tact. The investigator gets different types of evidence:

1. Physical evidence
2. Medical evidence
3. Oral evidence

23.10.4.1 Physical Evidence

The investigator must locate and collect the following:

1. *Corpus delicti, i.e.*, the infant's body or its remnants
2. Evidence relating to the recent delivery
3. Clothes of the mother
4. Clothes used at the time of delivery
5. The instrument used in killing the infant, if any.

23.10.4.2 Medical Evidence

The medical evidence is the most important evidence in cases of infanticide. As the charge of infanticide is a very serious charge, the doctor must confirm that:

1. The infant was alive at the time of birth. The infant was not stillborn.
2. The birth took place recently.
3. The infant was viable and did not suffer from diseases or congenital defects.
5. The infant did not die of natural causes.
6. The death of the infant was homicidal.
7. The injuries on the person of the infant are not birth injuries and could not be caused due to the accident(s) alleged by the mother.
8. Age of the infant.

In addition, medical examination of the suspect mother should reveal that:

1. The mother delivered a child.
2. The delivery was recent (time interval?).
3. The delivery was normal.
4. The mother was normal and she did not suffer from defects, which could cause the death of the infant.

In cases where a mother denies the motherhood of a dead infant, the relationship can be established through DNA.

23.10.4.3 Oral Evidence

The investigator records the statements of the following:

1. The mother and the involved relatives
2. The doctors or persons who helped the mother at the time of delivery and later provided medical support
3. The possible witnesses, involved in the infanticide; or, in the disposal of the body.
4. Chance witnesses who witnessed delivery, infanticide process, disposal of the body and other events. Often neighbours give valuable clues.

23.11 ABORTION

Abortion is the expulsion of products of conception: the fertilised ovum or developing foetus of any womb age prematurely. Sometimes the term abortion is limited to the womb age of conception of three months or more. The terms "miscarriage" and "premature births" are used to indicate un-induced expulsions of foetus which takes place during the third to the sixth month of pregnancy and sixth to ninth months of pregnancy respectively. For our purpose, no such distinction is made.

Abortion may be:

1. Accidental
2. Spontaneous
3. Induced

Accidental abortions are due to some accident the subject may suffer. Fall, extreme grief or emotional disturbance may lead to abortion.

The spontaneous abortions are those which are caused by mal-functioning of the body itself.

The induced abortions are caused through human effort. The latter are classified as:

a. Medical
b. Criminal

Medical abortions are necessitated by medical considerations for the safety and well-being of the mother. Criminal abortions are carried out to terminate unwanted pregnancies. Unwanted pregnancies are not rare among unmarried girls, widows, victims of rape, professional prostitutes and in some cases among married couples whose family size has become too large to permit more additions. Formerly, unwanted pregnancies were terminated illegally.

The law in India has been modified now. Practically any female can get the unwanted pregnancy terminated confidentially in any government approved hospital. Thus, criminal abortions which were a serious problem of substantial proportions prior to these laws have contracted considerably. Now, abortions attract police actions only when the act is performed by a quack under improper conditions. The female may die in the process.

Under Medical Termination of Pregnancy Act, 1971, a medical practitioner can terminate the pregnancy if in his opinion, formed in good faith:

1. *The continuance of the pregnancy would involve a risk to the life of the pregnant woman or of grave injury to her physical or mental health.* ***[section 3(2)(i).]***
2. *There is a substantial risk that if the child were born, it would suffer from such physical or mental abnormalities as to be seriously handicapped.* ***[section 3(2)(ii).]***

Explanation I.—

Where any pregnancy is alleged by the pregnant woman to have been caused by rape, the anguish caused by such pregnancy shall be presumed to constitute a grave injury to the mental health of the pregnant woman.

Explanation II.—

Where any pregnancy occurs as a result of the failure of any device or method used by the married woman or her husband for the purpose of limiting the number of children, the anguish caused by such unwanted pregnancy may be presumed to constitute a grave injury to the mental health of the pregnant woman.

23.11.1 Methods of Abortion

In government approved hospitals abortions are carried out under proper medical care and under hygienic conditions. Usually, curettage and suction are employed after the subject has been properly prepared. Very few deaths occur in the process. For example, in England and Wales in 1972, 157,000 legal abortions were done, only 10 deaths occurred.

Quacks employ a variety of methods, which often prove torturous and sometimes fatal to the subject. The common methods are:

- Violence
- Drugs
- Womb interference

23.11.1.1 Violence

Vigorous massage, exercise, beating, falling, jumping are sometimes employed. They are mostly ineffective. However, at times beating and fall, intended to cause abortions, have actually caused deaths.

23.11.1.2 Drugs

A variety of drugs is employed to secure abortions.

1. They may be purgatives (e.g., castor oil). Purgatives upset the stomach. It is believed they may also upset the womb. Usually, they do not.
2. They may be drugs which promote menstrual flow, (e.g., essential oils, ergot) they are poisonous and sometimes cause deaths. Use of hormones for the purpose may prove safer through absolute efficacy is yet to be proved.
3. There are drugs, which cause contraction of the uterus. For example, quinine and ergot have been used for the purpose but with doubtful results.

23.11.1.3 Womb Interference

Womb interference is an infallible method. It is the ultimate resort of the criminal abortionist. There are numerous methods including the following:

1. Injection of fluids
2. Instrumental interference
3. Electrical interference

Fluids injected in the uterus are hot water, soap solution, corrosive lysol solutions. They cause irritation and may result in abortion. Similar is the action of certain pastes like arsenious oxide, red lead, asafoetida (*Hing*) or even of *madar* juice.

Instruments used by quacks vary tremendously. Nails, knitting needles, bamboo sticks, twigs of certain plants, hair pins, glass rods, and catheter have been used. Usually, the intention is to cause rupture of membrane containing the ovum or foetus. Sometimes the instrument is smeared with certain juices or pastes which cause irritation.

Fig. 23.16

Criminal abortion. Autopsy revealed perforated womb – mechanical interference

Electrical interference is a novel way, which leaves no traces practically unless current causes burns. The negative pole is applied to the vaginal cervix and the positive pole is applied to the sacrum or lumbar vertebra. A suitable voltage is applied. Uterus contracts and its contents are expelled.

23.11.2 Cause of Death

The following are the causes of death in an abortion:

23.11.2.1 Shock

The subject gets shocked due to extreme fright or from reflex vagal inhibition and dies within seconds of the processing of the abortion.

23.11.2.2 Air Embolism

Air may enter into the blood stream through the fluid injected into the uterus. The air bubbles block blood flow and cause death.

23.11.2.3 Haemorrhage

Injuries to uterus or vagina cause excessive bleeding which may result in death.

23.11.2.4 Toxic Effects of Drugs

Certain drugs especially metallic poisons cause toxicity, which proves fatal in some cases.

23.11.2.5 Complications

Complications may develop — acute infection, septicemia, peritonitis and cause death.

23.11.3 Investigator's Role

Due to liberalisation of abortion laws, the number of illegal abortions has come down considerably. Now only those cases come to the police where the subject is dying or has died because an incompetent person negligently attempted abortion. As in the cases of rape, the evidence is of three types:

- Oral evidence
- Medical evidence
- Physical evidence

23.11.3.1 Oral Evidence

1. The statement of the subject who gives information:
   - The persons who took her to the abortionist.
   - The persons at the place where the abortion was done.
2. The statement of the abortionist.
   - The details of the process
   - The time and date when abortion was done
   - The fetal age
   - The fee charged by the abortionist
3. Statements of the members of the family

In case the abortion has caused death, the relevant information about the death has to be collected from relatives and friends. The following questions may help:

1. When did the victim die?
2. When was the abortion done?
3. Who was the abortionist?
4. How old was the pregnancy?
5. What method, instrument, chemicals were employed for abortion? Only abortionist or the witness present at the scene can answer these questions.

23.11.3.2 Medical Evidence

Ascertain from the attending doctor the following facts:

1. If the woman was really pregnant
2. If she had aborted
3. The approximate fetal age

4. Time elapsed since abortion
5. Method of abortion
6. Injuries caused to the subject including inflammation, bruises, scratches, perforations, if any, their size, age, character, and positions.
7. Any foreign material present in vagina or uterus; fluid, chemicals, plant material, device or its fragments
8. Symptoms of any drugs administered orally, locally or by injections.

In cases of death a team of competent medico-legal experts perform autopsy. They also find:

1. If there is any residual material of conception in the womb
2. If there are any injuries to the womb, vagina or surrounding parts inside
3. Signs and symptoms of poisoning if any
4. Immediate cause of death

23.11.3.3 Physical evidence

Physical evidence plays an important role in establishing abortion. The following materials are collected:

1. All vaginal washes or swabs
2. Correct material for toxicological analysis.
3. Residual drugs with the victim or at the scene of abortion.
4. Clothes of the subject.
5. Expelled material, if available
6. Instruments of abortion including syringe and contents of the syringe
7. Any leftover fluids used for facilitating the abortion.

23.12 ADDITIONAL READINGS

1. Subramanyam, BV. *Modi's Medical Jurisprudence and Toxicology.* Butterworth, New Delhi.
2. Polson, *e.g. et al. The Essentials of Forensic Medicine.* Pergamon Press, New York.
3. Simpson, K. *Taylor's Principles and Practice of Medical Jurisprudence.* J & A Churchil Ltd London.

23.13 CASE LAW

Supreme Court Cases – 21st Century

23.13.1 Injury Source in Post-mortem Report[3]

Author's Summary

The High Court substituted the evidence of the expert and that of the eyewitnesses by their own opinion. The SC found no proper base for the substitution and reversed the High Court's verdict.

Highlight italicised

3. *State of Punjab v Jugraj Singh*, AIR 2002 SC 1083 : 2002 AIR SCW 823 : 2002 Cr LJ 1503 (SC).

Relevant Extracts (Verbatim)

The High Court found that the oral evidence of Hardip Singh (P.W. 2) and Sarabjit Singh (P.W. 3) was not consistent with the medical evidence, which was sufficient to hold that they were not the eyewitnesses. Despite the expert opinion that the injuries found on the person of the deceased were gunshot injuries and the injuries caused by a sharp edged and blunt weapon, the High Court plunged into the exercise of finding out as to whether the aforesaid injuries could be caused by gun shots. Keeping in mind the distance between the accused and the victim, as stated by the eyewitnesses, the court held that there was no blackening, tattooing or collar of abrasion or charring on the injuries found on the person of the deceased, they could not have received such gunshot injuries from the distance as detailed by the eyewitnesses. The court found that as in the post-mortem report Exh. PA, it was not mentioned that the injuries found on the person of the deceased were caused by a firearm, the Doctor was not justified to state in the court that the injuries found on the person of the deceased were gunshot injuries. The High Court did not rely on the statement of the doctor and arrived at its own conclusions. The High Court disbelieved the eyewitnesses on finding a number of injuries on the person of the deceased on account of the fact that the eye-witnesses were held to have stated the firing of only two gun shots.

> *The finding of the High Court in this regard cannot be justified. The High Court in this could not substitute its own opinion for the opinion of the expert who had categorically stated that injuries received by the deceased were the gun shot injuries. The statements of the eye-witnesses have not been properly appreciated. Hardip Singh (P.W. 2) had categorically stated that the respondents-accused armed with Double Barrel Guns and the Gandasa had come on the spot. Jugraj Singh, accused raised lalkara that sons of Jagdip Singh should not go alive. Jugraj Singh fired a shot hitting Gurtej Singh on the head, Narinder fired a shot hitting Dosagar Singh in the head near the left eye. Jugtar Singh fired another shot from his gun at Gurtej Singh and Narinder Singh fired another shot on Sodagar Singh from his gun. Thereafter, shots were fired upon the witnesses and when they were running away the sounds of two more fire-shots were heard.*

Nothing could be split out from their cross-examination which could weaken the testimony of aforesaid two witnesses regarding the firing of a number of shots at the time of occurrence. It is to be kept in mind that the shots were fired from the Double Barrel gun and the cartridges recovered show that the firing would have sprayed the pellets all around. In such a situation, it could not be ruled out that the deceased could have received more than one or two injuries. As the witnesses had run away from the spot to save their lives, they could not state as to what happened to the deceased after they were forced to leave the place of occurrence.

> *The testimony of the witnesses could not be discarded only on the ground that they happened to be the relations of that they happened to be relations of deceased.*

Under the circumstances of the case P.Ws. 2 and 3 were proved to be natural witnesses.

23.13.2 Data Essential[4]

Author's Summary

It is a case where the SC superseded the opinion of a medico-legal expert on the cause of death. It gave benefit of doubt to the accused on the basis of quotes of authorities (books). The evidence of the doctor was based upon the postmortem examination of a putrefied body. The SC felt that the evidence was not sufficient to distinguish it as murder from suicide or accidental death.

Highlight italicised

4. *Mohd. Zahid v State of Tamil Nadu,* AIR 1999 SC 2416 : 1999 AIR SCW 2556 : 1999 Cr LJ 3699. (SC).

Relevant Extracts (Verbatim)

A careful perusal of these circumstances would show that circumstances 1 to 13 either taken together or independently would not assist the case of the prosecution to prove conclusively that the death of Jabeena is homicidal and is not either suicidal or accidental. As observed by the High Court itself the sheet anchor of the prosecution case is the medical evidence which is noticed as the 14th circumstance by the High Court, if the medical evidence is accepted, as has been done by the courts below, then reasons 1 to 13 would provide materials to establish that it is the appellant and the appellant alone who could have caused the death of Jabeena.

On behalf of the appellant, it is strongly contended by Mr. U.R. Lalit, learned Senior Counsel, that the prosecution has not been able to establish that Jabeena's death was homicidal. It is contended, at any rate, the evidence of P.W. 8 creates a reasonable doubt as to the real cause of death of Jabeena. It was further contended that from the material available at the time of the post-mortem, it would not have been possible for a doctor to establish the real cause of death in view of the high stage of decomposition of the body. On behalf of the State, Mr. R. Mohan, learned Senior Counsel, supported the judgments of the courts below and contended that there was no reason whatsoever why the evidence of P.W. 8 should not be accepted.

Since the entire prosecution case rests on the evidence of P.W. 8, we will examine the said evidence in detail.

During the course of the post-mortem examination, P.W. 8 noticed high decomposition of the body. She noted the following injuries on the dead body:

1. Singeing of scalp hair over the middle of frontal and parietal regions 8 cm x 6 cm.
2. Reddish black discolouration of skin over face, front of chest, left breast, right shoulder, right side of abdomen, front of upper and middle third of left leg, front of left leg, front of left thigh, inner aspect of left thigh and upper, middle and lower part of back.
3. Deep splitting of the skin over lower part of right breast and upper thigh of front of right thigh exposing the underlying fatty tissue.
4. Blackening of skin over front and both sides of neck, the skin on the back of the neck did not show any discolouration. The skin on the front of neck showed a horizontal and uniformly hardened and thickened area. 1½ cm. in width, 0.5 cm in thickness and 0.5 cm in length, situated 5 cms. below the right ear lobe on right side of front of neck, 6 cm. below the left ear lobe on left side of front of neck. On dissection of the tissue of neck, a contusion reddish black in colour 4 cm × 3 cm was seen on right side over the right side of hyoid bone and a contusion 3 cm × 2 cm on left side near the left lobe of thyroid.
5. Dark reddish black contusion 14 cm × 12 cm × 1 cm was on the front of right side of chest.
6. There were no burns on left shoulder below the neck and back of neck, upper part of right breast, middle of chest between the breasts, left side of abdomen, genitals, outer aspect of chest and abdomen on both sides, both upper and lower limbs fully, middle and lower part of right thigh, both ankles and feet, buttocks and back of both lower limbs fully.

On an internal examination of the body, P.W. 8 noticed that the lungs were decomposing. Mucosa reddish black in colour was found in the trachea. Very few black soot particles were seen inside the teeth.

Hyoid bone was intact. Stomach was empty. Mucosa in the stomach did not show any discolouration.

Liver, spleen, and kidney were decomposing. Bladder and Uterus were empty. Brain was found liquefied.

On the basis of the above observations, P.W. 8 recorded her opinion of Jabeena's death as follows:

> Died of asphyxia and cerebral anoxia due to cumulative effects of compression of neck and burns.

In her oral evidence, she opined that injury No. 4 noticed by her could be caused by compression of the neck with minimal pressure and the said injury, according to her, was ante-mortem in nature. She opined that the hyoid bone was not fractured because the pressure on the neck was minimal. She further opined that injury Nos. 1 to 3 and the changes found in the trachea along with the presence of soot particles inside the trachea could have been due to burns and that these burns would have been ante-mortem. She was very specific that neither the injury to the neck nor the burn injuries could have been accidental or suicidal.

Thus, it is seen that as per the evidence of P.W. 8, there are two causes of death, namely, asphyxia and cerebral anoxia which cumulatively caused the death and this was due to compression of neck and burns.

During the cross-examination the defence has suggested to her, that the contusion noticed by her as injury No. 4, was not caused by external pressure but due to swelling that were caused during the process of decomposition of the body. Hence, she could have wrongly concluded that death was partly due to asphyxia. To establish that there was a reasonable possibility of P.W. 8 mistaking the swelling caused by decomposition as contusions, the defence confronted her with certain well-recognised textbooks on the subject. *Firstly*, P.W. 8 was confronted with the statement appearing in the text "*Lyon's Medical Jurisprudence*" wherein, at pp 149 and 150 (1953 Edn.), the following statement was found: "Other effects of pressure of gas are: "Distention of the tissues of the neck resulting in accentuation of the natural groove and frequently giving rise to appearances suggestive of strangulation".

P.W. 8 accepted the fact that "*Lyon's Medical Jurisprudence*" was one of the authoritative books on the subject. But, she still disagreed with the statement extracted from the said book without assigning any reasons. However, she did not support her opinion with any other acceptable material. this opinion of P.W. 8 has to be scrutinised in the following background: *Firstly*, the fact that she had not seen any external injury corresponding to the internal contusion which, according to her, was the basis of her opinion that asphyxia by strangulation was caused. *Secondly*, in view of the specific statement made by her in the course of her evidence that she had not seen any ligature marks. *Thirdly*, that the hyoid bone which ordinarily would be damaged if external pressure is applied, was found to be intact.

During further cross-examination, P.W. 8 recognised Keith Simpson as a world authority on medical jurisprudence. But she did not agree with the said Keith Simpson's opinion that Parikh's book is a comprehensive and outstanding book on reference for court work. This reference to Keith Simpson's opinion in Dr. Parikh's book was put to P.W. 8, to suggest to her that if the hypothesis extends to the head, it may be mistaken as a violence to the neck or smotherings as found at p 159 of Dr. Parikh's textbook (4th Edn. 1995). She disagreed with this statement as found in Parikh's book, solely based on her personal experience and not supported by any other authority. While so disagreeing with Parikh's book, she insisted on stating that the horizontal and uniformly hardened and thickened area mentioned by her as injury No. 4 must be due to ligature, even though according to her post-mortem report and evidence in the court, she had not seen any ligature marks on the body of Jabeena.

The defence has further confronted P.W. 8 with the statement found in the book "the Essentials of Forensic Medicine" by Dr. K.S. Narayana Reddy to establish the fact, that on the decomposition of a body, the gas collects in the subcutaneous tissue and becomes emphysematous. This would then create a false impression of ante-mortem obesity (Stout). P.W. 8 disagreed with this opinion also, without supporting her opinion on the basis of any other authority. From the statements found in various textbooks referred to above, notwithstanding the disagreement of P.W. 8, we will have to conclude that there is a possibility of the existence of swelling occurring in a decomposing body, similar to the one noticed by P.W. 8 which give rise to appearances suggestive of strangulation. There is a reasonable possibility that the contusions noticed by P.W. 8 are those swellings which could have been caused due to decomposition of the body of Jabeena. Therefore, these suggestions of defence made to P.W. 8 cannot be lightly brushed aside.

> *More so, in the background of the fact that P.W. 8 had conducted the post-mortem on Jabeena's body nearly 8 days after it was buried, and admittedly even according to P.W. 8, the body of Jabeena had decomposed considerably at the time of the post-mortem examination. This is coupled with the fact that she had admitted in her evidence that she has no other authoritative text to contradict or support her, as against the statements found in the text books like the "Lyon's Medical Jurisprudence", Parikh's textbook on Medical Jurisprudence. The Essentials of Forensic Medicines by Dr. K.S. Narayana Reddy.*

The second cumulative cause of death as per the opinion of P.W. 8 is cerebral anoxia caused due to burns. It is true that P.W. 8 noticed certain burn marks on the face and chest of Jabeena. It is seen from the textbooks and from the evidence of P.W. 8 that anoxia of the brain is caused due to lack of supply of oxygen to the brain which could be due to burning as found in the body of Jabeena, P.W. 8 in her statement before the court stated thus: "Cerebral anoxia means the stoppage of blood supply to the brain. In the event of cerebral anoxia in the post-mortem examination except the pale appearance of the brain, there will not be any other change in the brain. As the brain had been liquefied in this case, it cannot be stated whether brain becomes pale or not. There was no other sign by which I could say that there was cerebral anoxia. Cerebral anoxia in my opinion or conclusion based on my observation and findings in the post-mortem examination. It is not correct to say that no opinion of cerebral anoxia could be given or arrived at in the case of liquidation of the brain". *A cautious reading of this part of P.W. 8's evidence shows in one part P.W. 8 admits that the one and only method by which a medical examiner can conclude that cause of death was due to cerebral anoxia is by noticing pale appearance of the brain. She also specifically admits that there will not be any other change in the brain in the case of cerebral anoxia and since the brain had become liquefied, it cannot be stated if the brain had become pale or not. She is also specific in her statement that there was no other sign by which she could say that was cerebral anoxia.* Stopping for a while at this stage and examining P.W. 8's evidence, one finds that at the time of the post-mortem examination, Jabeena's brain had liquefied and there was no way by which P.W. 8 could have noticed the paleness in the brain. However, in the latter part of her evidence, she deviates from her earlier opinion and states that it is not correct to say that no opinion of cerebral anoxia could be given or arrived at in the case of liquefaction of the brain. These two statements are diametrically opposed to each other and we find it rather difficult to accept this part of her evidence which is so self-contradictory. In our view, the opinion of P.W. 8 that the cause of death as recorded by her is due to the cumulative effect of asphyxia and cerebral anoxia, is rather difficult to accept.

> *We are aware of the fact that sufficient weightage should be given to the evidence of the doctor who has conducted the post-mortem, as compared to the statements found in the text-books, but giving weightage does not ipso facto mean that each and every statement made by a medical witness should be accepted on its face value even when it is self-contradictory. This is one such case where we find that there is a reasonable doubt in regard to the cause of death of Jabeena and we find it not safe to rely upon the evidence of P.W. 8, solely, for the purpose of coming to the conclusion that Jabeena's death is proved by the prosecution to be homicidal.*

23.13.3 Rigor Mortis[5]

Author's Summary

In this case of murder, defence wanted to exploit the presence/absence of *Rigor Mortis* for time of death. SC, quoting chapter and verse, ruled:

"The exact time of death, therefore, cannot be established scientifically and precisely, only because of presence of rigor mortis or in the absence of it."

Highlight italicised

Relevant Extracts (Verbatim)

We may deal with the question as regards presence of *rigour mortis*.

In *'Modi's Textbook of Medical Jurisprudence and Toxicology'*, 21st Edn, at p 171, it is stated:

> *Rigor mortis* generally occurs, while the body is cooling. It is in no way connected with the nervous system, and it develops even in paralyzed limbs, provided the paralyzed muscle issues have not suffered much in nutrition. It is retarded by perfusion with normal saline.

Owing to thet setting in of rigor mortis all the muscles of the body become stiff, hard, opaque and contracted, but they do not alter the position of body or limb. A joint rendered stiff and rigid after death, if flexed forcibly by mechanical violence, will remain supple and flaccid, but will not return to its original position after the force is withdrawn; whereas a joint contracted during life in cases of hysteria or catalepsy will return to the same condition after the force is taken away.

Rigor mortis first appears in the involuntary muscles, and then in the voluntary. In the heart it appears, as a rule, within an hour after death, and may be mistaken for hypertrophy, and its relaxation or dilatation, atrophy or degeneration. The left chambers are affected more than the right. Post-mortem delivery may occur owing to contraction of the uterine muscular fibres.

In the voluntary muscles rigor mortis follows a definite course. It first occurs in the muscles of the eyelids, next in the muscles of the back of the neck and lower jaw, then in those of the front of the neck, face, chest and upper extremities, and lastly extends downwards to the muscles of the abdomen and lower extremities. Last to be affected are the small muscles of the fingers and toes. It passes off in the same sequence. However, according to H.A. Shapiro this progress of rigor mortis from proximal to distal areas is apparent only, it actually starts in all muscles simultaneously but one can distinguish the early developing and fully established stage, which gives an indication of the time factor.

Time of Onset.—This varies greatly in different cases, but the average period of its onset may be regarded as three to six hours after death in temperate climates, and it may take two to three hours to develop. In India, it usually commences in one to two hours after death."

In Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology' 6th Edn, at p 3.14, it is stated:

> *Rigor mortis* (rigor-rigidity; mortis of death) is a condition characterized by stiffening and shortening of the muscles which follow the period of primary relaxation. It is due to chemical changes involving the structural proteins of the muscle fibres and indicates the molecular death of its cells.

5. Appeal (Crl.) 1169-1170 of 2005; *Baso Prasad v State of Bihar*, date of judgment 24 November 2006; Bench: S.B. Sinha & Markandey Katju, JJ.; Judgment: S.B. Sinha.

The contractile element of the muscle consists of protein filaments of two types, *viz.*, myosin and actin, which are arranged and organized interdigitating manner. In the relaxed state, the actin filaments interdigitate with myosin filaments only to a small extent but when the muscle contracts, they interdigitate to a great extent due to the presence of ATP (adenosine triphosphate). The production and utilization of ATP are constantly balanced in life. After death, ATP is resynthesised for a short time depending upon the glycogen available locally, but after this glycogen is used up, ATP cannot be resynthesised. This leads to the fusion of myosin and actin filaments into a dehydrated stiff gel resulting in the condition known as rigor mortis. During rigor mortis, the reaction of muscle changes from slightly alkaline to distinctly acid owing to the local formation of lactis acid. Rigor mortis persists until autolysis of myosin and actin filaments occurs as a part of putrefaction. When autolysis occurs, the muscles soften and secondary relaxation sets in.

Rigor mortis can also be broken by mechanical force. Thus, if a limb, which is stiff due to rigor, is flexed forcibly at a joint, the limb becomes flaccid and will remain so thereafter. This is known as breaking of rigor mortis. Existing rigor mortis is broken down at least partially in the process of removal of the body from the crime scene to mortuary, and this may mislead the doctor in estimation of time since death. It is therefore essential to make a note of its stage of development while visiting the crime scene.

All muscles of the body, voluntary and involuntary, are affected by rigor. It first appears in involuntary and then in voluntary muscles. It is not dependent on the nerve supply as it also develops in the paralysed limbs. It is tested by (1) attempting to lift the eye lids, (2) depressing the jaw, and (3) gently bending the neck and various joints of the body."

At p 3.16 it is stated:

> The medico-legal importance is as follows: (1) It is a sign of death, (2) It helps to estimate the time since death. (3) It may give information about the position of the body at the time of death and if it has been altered after rigor has set in. As for example, if a person dies with the hands and legs supported against a brick wall and the position of the body has been hanged after rigor set in, the hands and legs would remain raised in an unnatural position (without support).
>
> The factors which influence rigor mortis are: (1) age and condition of the body (2) mode of death, and (3) surroundings.
>
> Age and condition of the body: In children and old people, rigor develops earlier than in the adults. The onset of rigor is later and the duration longer in the strong muscular person. The more feeble or poorly developed the muscles, the more rapid is the time of onset, and the shorter the duration.
>
> *The exact time of death, therefore, cannot be established scientifically and precisely, only because of the presence of rigour mortis or in the absence of it.*

In *Mangu Khan v State of Rajasthan*, (2005) 10 SCC 374 : AIR 2005 SC 1912 : 2005 Cr LJ 1748, this Court rejected a similar contention, opining:

> In the first place, neither post-mortem report suggests that the death had taken place exactly 24 hours before the post-mortem was conducted. All that the post-mortem reports say is that the death had occurred within 24 hours prior to post-mortem examination. Undoubtedly, the post-mortem examination was carried out at 11.00 am/12 noon on 11 July 1997. In other words, the post-mortem reports suggest that the death might have occurred any time after 11.00/12.00 noon of 10 July 1997. The contention urged by reference to textbooks on forensic medicine to show the time within which rigor mortis develops all over the body also has no factual basis. It depends on various factors such as constitution of the deceased, season of the year, the temperature in the region and the conditions under which the body has been preserved. The record indicates that the body was taken from the mortuary. We notice that there is no cross-examination, whatsoever, of the doctor so as to elicit any of the material facts on which a possible argument could have been based. If these are the circumstances, then the presence of rigor mortis all over the body by itself cannot warrant the argument of the learned counsel that the death must have occurred during the previous night. Acceptable ocular evidence cannot be dislodged on such hypothetical basis for which no proper grounds were laid.

Yet again in *Thangavelu v State of Tamil Nadu,* (2002) 6 SCC 498 : AIR 2002 SC 2759 : 2002 Cr LJ 3558, this Court observed:

> We have heard learned counsel and carefully looked into the material on record. From the evidence of PW-5, the doctor, we find that there is a possibility that the incident in question might have occurred about 39 hours prior to the post-mortem. Though in the examination-in-chief, PW-5 has stated that the time between the death and post-mortem could be 16 to 24 hours which fits in with the prosecution case, in the cross-examination he has very clearly stated that in this case death would have been caused about 39 hours before the post-mortem which would be sometime after 5.30 pm on 15 December 1990. This the doctor has stated by taking into consideration the time and month of the incident as also the time required for the setting of rigor mortis and passing off of the same. According to the doctor, in the month of December in a place like Erode the rigor mortis may set in after about 2 to 3 hours after the death. He has stated that for the rigor mortis to reach from the leg to head, it would take 12 hours and the same would remain in existence for about another 12 hours. Thereafter, it would gradually diminish in the reverse direction *i.e.* from head to leg taking about another 12 hours and on this basis when he examined the body of the deceased, he found the rigor mortis had reversed almost to the end of the legs. By this process he came to the conclusion that the death in question must have occurred about 39 hours before post-mortem.
>
> *(In the instant case) The incident took place in the winter season. The deceased was aged about 50 years. Rigor mortis, thus, would be well marked. Rigor mortis, as noticed hereinbefore, appears after two to three hours. It is well developed from head to foot in about 12 hours. The age, muscular condition and activity before death, manner of death and atmospheric conditions are relevant factors. We, therefore, do not find any merit in the said contention of Mr. Rai.*

23.13.4 Eye-witness Account v Medico-legal Expert Evidence[6]

Author's Summary

This is a judgment in which the SC has given primacy to eyewitness accounts over medical evidence when the eyewitness accounts are consistent, logical, credible and trustworthy. It has also defined reasonable doubt as *'not an imaginary trivial or a merely possible doubt: but a fair doubt based upon reasons and common sense. It must grow out of the evidence in the case.*

On the above considerations, it reversed the HC acquittal in this murder case.

Highlights italicised

Relevant Extracts (Verbatim)

7. A bare perusal of the judgment of the High Court shows that it has disposed of the appeal in a rather casual manner. Most of the conclusions arrived at by the High Court are *per se* not on sound footing. The appellate court will not abjure its duty to prevent miscarriage of justice by interfering where interference is imperative. Where doubt is based on irrelevant grounds or where the Court allows itself to be deflected by red herrings drawn across the track, or where the evidence accepted by the trial court is rejected by the High Court after a perfunctory consideration or where the baneful approach of the Court has resulted in vital and crucial evidence being ignored or for any such adequate reason, the Court should feel obliged to secure the ends of justice, to appease the judicial conscience, as it were. The High Court has noted that the names of witnesses do not appear in the first information report. That by itself cannot be a ground to doubt their evidence as noted by this Court in *Bhagwan Singh v State of Madhya Pradesh,* JT 2002 (3) SC 387 : 2002 Cr LJ 2024 : 2002 AIR SCW 1532 : AIR 2002 SC 1621; *Chittar Lal v State of Rajasthan*, 2003 AIR SCW 3466 : 2003 Cr LJ 3548 : 2003 AIR SCW 3466 and *State of Madhya Pradesh v Man Singh,* (2003) 6 Supreme 202 : 2003 Cr LJ

6. *State of Madhya Pradesh v Dharkole*, AIR 2005 SC 44 : 2004 AIR SCW 6241 : 2005 Cr LJ 108 (SC).

3548 : AIR 2003 SC 3590. There is no requirement of mentioning the names of all witnesses in the first information report.

> **8.** *Coming to the plea that the medical evidence is at variance with ocular evidence. It has to be noted that it would be erroneous, to accord undue primacy to the hypothetical answers of medical witnesses to exclude the eye-witnesses account which had to be tested independently and not treated as the 'variable' keeping in the medical evidence as the "constant".*
>
> **9.** *It is trite that where the eyewitnesses account is found credible and trustworthy, medical opinion pointing to alternative possibilities is not accepted as conclusive.*
>
> Witnesses, as Bentham said, are the eyes and ears of justice. Hence the importance and primacy of the quality of the trial process. *Eyewitnesses' account would require a careful independent assessment and evaluation for their credibility which should not be adversely prejudged making any other evidence, including medical evidence, as the sole touchstone for the test of such credibility. The evidence must be tested for its inherent consistency and the inherent probability of the story; consistency with the account of other witnesses held to be creditworthy; consistency with the undisputed facts; the 'credit' of the witnesses; their performance in the witnesses-box; their power of observation Then the probative value of such evidence eligible to be put into the scales for a cumulative evaluation.*

10. A person has, no doubt, a profound right not to be convicted of an offence, which is not established by the evidential standard of proof beyond reasonable doubt. Though this standard is a higher standard, there is, however, no absolute standard. What degree of probability amounts to 'proof is an exercise particular to each case? Referring to of probability amounts to 'proof' is an exercise the inter-dependence of evidence and the confirmation of one piece of evidence by another a learned author says: [*See* "The Mathematics of Proof II" Glanville Williams; Criminal Law Review, 1979, by Sweet and Maxwell, p 340 (342)].

> The simple multiplication rule does not apply if the separate pieces of evidence are dependent. Two events are dependent when they tend to occur together and the evidence of such events may also be said to be dependent. In a criminal case, different pieces of evidence directed to establishing that the defendant did the prohibited act with the specified state of mind are generally dependent. A junior may feel doubt whether to credit an alleged confession, and doubt whether to infer guilt from the fact that the defendant fled from justice. But since it is generally guilty rather than innocent people who make confessions and guilty rather than innocent people who run away, the two doubts are not to be multiplied together. The one piece of evidence may confirm the other.

11. Doubts would be called reasonable if they are free from a zest for abstract speculation. Law cannot afford any favourite other than the truth. To constitute reasonable doubt, it must be free from an over emotional response. Doubts must be actual and substantial doubts as to the guilt of the accused persons arising from the evidence, or from the lack of it as opposed to mere vague apprehensions. ***A reasonable doubt is not an imaginary trivial or a merely possible doubt: but a fair doubt based upon reasons and commonsense. It must grow out of the evidence in the case.***

12. The concepts of probability, and the degrees of it, cannot obviously be expressed in terms of units to be mathematically enumerated as to how many of such units constitute proof beyond reasonable doubt. There is an unmistakable subjective element in the evaluation of the degrees of probability and the quantum of proof.

> *Forensic probability must, in the last analysis, rest on a robust common sense and, ultimately, on the trained intuitions of the judge*.

While the protection given by the criminal process to the accused persons is not to be eroded, at the same time, uninformed legitimization of trivialities would make a mockery of administration of criminal justice. This position was illuminatingly stated by Venkatachaliah., J. (as His Lordships then was) in *State of Uttar Pradesh v Krishna Gopal,* (1988) 4 SCC 302 : AIR 1988 SC 2154 : JT 1988 (3) SC 544.

13. On that score also the High Court's conclusion that the medical evidence varied with the ocular evidence suffers from vulnerability.

14. It is not necessary for the prosecution to examine somebody as a witness even though the witness was not likely to support the prosecution version. Non-examination of some persons *per se* does not corrode vitality of prosecution version, particularly when the witnesses examined have withstood incisive cross-examination and pointed to the respondents as the perpetrators of the crime.

15. In the instant case the prosecution has indicated the reasons as to why it did not choose to examine the alleged independent persons. There is nothing unusual in the conduct of the eyewitnesses as was inferred by the High Court. The High Court has put unwarranted stress on certain aspects like the political party accused Dharkoke belonged, or the place from where the witnesses came together. The High Court found that the business of the PW-1 was claimed to be a supply of milk, but no sufficient basis have been indicated as to where he was going to sell milk at the time of alleged offence. These minor points do not affect the credibility of evidence and should not have been magnified.

> *Looking at from the aforesaid perspective the judgment of the High Court is indefensible and therefore set aside. It is true that in case acquittal has been recorded the Appellate Court should not lightly interfere with the same. But where the evidence has not been properly analysed or the Court has acted on surmises or conjectures, it is the duty of the Appellate Court to set right the wrong. The case at hand is one where the High Court ignored the relevant aspects and unnecessarily put emphasis on certain aspects which did not have any foundation. That being so, the appeals are allowed and the judgment of the trial court is restored by reversing the judgment of the High Court. The respondents shall surrender to custody forthwith to serve remainder of sentence.*

23.14 ADDITIONAL CASE LAW

23.14.1 *Corpus Delicti*[7]

The next question which in the context of these discoveries arises is whether in the circumstances of this case Kanhiya can be held guilty for murder of Mst. Dhooli and her son Shyoji? The investigating agency could not discover the *corpus delicti* nor is there any evidence on the record to show that both Mst. Dhooli and her son Shyoji died between 6th and 9 March 1972. The prosecution did not take care to bring on record any fact that the bones and pieces of clothes seized near the river either belonged to or could be that of Mst. Dhooli and her son Shyoji. In the absence of any material on record it is difficult to hold that Mst. Dhooli and Shyoji have died. In the view of the matter the charge under section 302, Indian Penal Code for committing murder of Mst. Dhooli and Shyoji cannot be sustained

23.14.2 Oral v Medical Evidence[8]

The wounds and injuries found on the body of the deceased according to the medical evidence were:

1. Incised circular wound all around the neck separating the head from the body.
2. Incised wound from the lower end of sternum to the upper margin of bladder 10″ x 6″ and abdominal organs such as stomach, intestines, and liver were protruding out of the wound.

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7. *Kanhiya v State of Rajasthan*, 1976 Cr LJ 1652 : 1976 WLN 160 : 1976 Raj LW 251.
8. *Bhagoji v Hyderabad Govt,* AIR 1954 Hyd 196 : 1954 Cr LJ 1378 : ILR 1954 Hyd 130. **Also see**: *Dhanna v State of Rajasthan*, AIR 1951 Raj 37 : 1951 Cr LJ 201 : 1950 Raj LW 357; *Abdul Salam v State of Jammu and Kashmir*, 1953 Cr LJ 1865 : 10 J&K LR 94; *Thakur v State of Uttar Pradesh*, AIR 1955 All 189 : 1955 Cr LJ 473 (All).

3. Incised circular wound over the lower end of the right arm, separating the right elbow joint which was absent.
4. Incised wound on the right side of the head 3″ × 12″ bone deep which was oblique.
5. Incised wound on the left cheek extending left pinna of the ear downwards to the left jaw 6″ × 1″ bone deep.

The learned Sessions Judge has mentioned in his judgment that the head alleged to be recovered from the well exactly corresponded to the incised circular wound of the neck.

I am told that these wounds were caused and truncation effected with the aid of an axe and three inches long knife. In *Mohinder Singh v State*, AIR 1953 SC 415 (N), it has been held that in a case where the death is due to the injuries or wounds caused by a lethal weapon, it is always the duty of the prosecution to prove by expert evidence that it was likely or at least possible for the injuries to have been caused with the weapon with which they are alleged to have been caused. It is no doubt true that the medical evidence is that such wounds could be caused by axe and knife. But it is unfortunate that no question has been put to the expert as to whether the weapon exhibited in the case as material object could cause the wounds as found on the body of the deceased. With the elimination of Rabhaji by reason of his acquittal one is left with a weapon which has been described by the prosecution as "*Ek lokhandi chaku jyache pate teen inch lamba and tayawar raktache dage ahet*", which has been rendered into English as: one iron knife whose blade is three inches long on which there are stains of blood. I am not prepared to believe that a clean and flawless truncation could be effected as shown at (1) and the chopping off as shown at (3) could be effected with the knife alleged to have been recovered from the appellant.[8]

23.14.3 Stomach Contents v Eyewitness Version[9]

There is another aspect of the medical evidence, which, though, not as important as the two aspects mentioned above, may also be referred to. The case of the prosecution is that Ram Sanehi had gone to his *Kharbuza* field with his son and daughter for eating *Kharbuzas*. There is evidence that they did eat *Kharbuzas* and almost immediately thereafter they started back for home. Within less than 5 minutes, Ram Sanehi met with his death near the culvert. The post-mortem report shows that Ram Saheni's stomach was empty which means that the evidence that he had eaten *Kharbuzas* just a little time before his death is untrue. Bal Kishore tried to wriggle out of this situation by saying that Ram Sanehi had eaten just a small slice of *Kharbuza*. But even then, Dr. Pandiya has stated that if the entire slice of *Kharbuza* was eaten by Ram Sanehi, its remains would be found in the stomach provided there was no vomiting after the gun-shot injuries. Since Ram Sanehi had not vomited, his large intestines could not have been found to be empty if the story of his children was true.[9]

23.14.4 Delayed Death[10]

The only question then is whether the accused is guilty of murder; in other words, whether it was the injury inflicted by him that was the cause of the death, and whether he had the requisite *mens rea*. The second part of the question can readily be answered in the affirmative. The accused goes at dead of night to the house of his wife who has left him, and then after locating her with the aid of his torch light, deliberately stabs her in the middle of the back with such force as to penetrate the spinal cavity and cause damage to the cord. The intention could only have been to kill.

9. *Subhash v State of Uttar Pradesh*, AIR 1976 SC 1924 : (1976) 3 SCC 629 : 1976 Cr LJ 1521.
10. *Davasia Yohannan v State of Kerala*, AIR 1958 Ker 207 : 1958 Cr LJ 1021 : 1958 Ker LT 273.

On the second question, the comparatively long interval of seven months between the injury and the death might, at first sight, induce an element of doubt as to whether their relation as cause and effect is not too remote. For, after all causing of death by injury is but the hastening of an inevitable event, and, when that event is so long delayed, the mind is tempted to ask whether the cause of the death is not really to be found in something other than the injury.

This is doubtless the basis of the rough and ready rule of the English common law (so rough and ready that it has not found acceptance in Scotland) that a death which occurs more than a year from the date when the injury was inflicted must be attributed to causes other than the injury and cannot form the basis of a charge of manslaughter or murder. In the present case however, we are satisfied that there is no room for any doubt that both factually and legally the injury was the cause of death. And, although the English rule has no application, we might observe that the death, in this case, is within the time laid down by that rule.

P.W. 9 has said that the injury had affected the spinal cord, and it is apparent both from the post-mortem findings and from the fact that complete paralysis of both the lower extremities was the immediate result of the injury, that the stab given by the accused had pierced the spine between the 6th and 7th vertebrae and cut the spinal cord. As P.W. 9's evidence stands, it would appear that the several sequelae described by her are so directly connected with each other as cause and effect as to make the death attributable to the injury.

There is no indication of any unexpected intervention, and as observed by Mayne at p 469 of his *Criminal Law of India,* 4th Edn. "any act is said to cause death within the meaning of section 299, when the death results either from the act itself or from some consequences necessarily or naturally flowing from that act, and reasonably contemplated as its result". Where without the intervention of any considerable change of circumstances the death is connected with the act of violence by a chain of causes and effects, the death must be regarded as a proximate and not too remote a consequence of the act of violence.

In discussing death from injury we find the following observations at p 238 of Vol I of *Taylor's Medical Jurisprudence* (11th Edn.) under the heading, "Wounds indirectly fatal":

> *Certain kinds of injuries are not immediately followed by serious consequences; but an injured person may die after a long or shorter period, and his death may be as much a consequence of the injury as if it had taken place on the spot. An aggressor is as responsible as if the deceased had been directly killed by his violence provided the fatal result can be traced to the probable consequences of the injury.*

This we consider to be a correct statement of the law. And with particular reference to the injury in this case we might refer to the statement at p 239 of the same book that wounds of the head and spine are particularly liable to cause death insidiously and that in injuries affecting the spinal cord or column, death is not an immediate consequence, unless the wound is above the origin of the phrenic nerves and that injuries affecting the lower portion of the spinal column do not commonly prove fatal for several months, death ensuing later from septic cystitis, bed-sores and toxaemia. Although for the purposes of this classification, Taylor has called such wounds indirectly fatal, in law it does not matter that death is from a secondary cause so long as that secondary cause is a natural consequence of the injury.

In his *Medical Jurisprudence* (11th Edn, p 260) Modi states as follows:

> *When the dorsal (thoracic) vertebrae are injured, the patient becomes bedridden on account of the paralysis of the lower limbs. He also suffers from paralysis of the bladder and rectum, and is always in danger of getting bed-sores and septic infection of the bladder and kidneys, which generally hasten death. Thus, death may occur after two or three weeks, if the upper dorsal vertebrae have been injured; while life may be prolonged for years with partial paralysis of the limbs, if the lower dorsal or the lumbar vertebrae have been fractured.*

In Price's *Medicine* it is observed (at p 1542 of the 9th Edn.) with reference to injuries of the spinal cord that with lesions at lower levels death is liable to take place within a few weeks or months from bed-sores or infection of the urinary tract. It would thus appear that paralysis of the lower limbs and of the bladder followed by cystitis and bed-sores and, in turn, by death are natural consequences of an injury to the spinal cord at its lower levels. And in this connection, we notice that the post-mortem certificate, Ext. p 10, speaks of three large ulcers on the body. These are obviously bed-sores, and so it would appear that the after-effects, in this case, were just those which, according to the text books cause as a result of an injury to the spinal cord in the thoracic region. Death from cystitis and bed-sores is the direct result of paralysis caused by the injury and it would appear that there are not so many links in the chain of causation as the medical evidence by its reference to syncope, asthenia and trophic changes would suggest.

The murder was a cruel and deliberate murder and the fact that death was not as immediate as was probably intended but was after months of suffering is no extenuation.[10]

23.14.5 Diminished Responsibility[11]

There were, however, only two injuries on the body of the deceased and these injuries were not grievous. The medical evidence was to the effect that these injuries could not have ordinarily produced death. If the injuries can be called only the remote cause of death, and death of the deceased is not proximately connected with the act of violence, the appellants cannot be held responsible for causing death, and cannot be credited with the knowledge that such bodily injuries as the deceased sustained were likely to cause his death. It follows that the appellants cannot be convicted for an offence of culpable homicide not amounting to murder. I am, therefore of opinion that the conviction of the appellants must be altered to one under section 323, Penal Code from that under section 304, Penal Code.[11]

23.14.6 Post-mortem -Necessity[12]

But whether it was the injury caused by the passing of the bullet through the body of Ladha which caused his death, is more than we can find. The bullet for aught we know, may not have touched any vital organ of his. Cases have not been wanting in which death has occurred not so much as a result of the injury caused as by the resultant shock. In the absence of medical evidence, it is not safe to say that the death of Ladha was due to gunshot. In these circumstances, the offence made out against the accused is not under section 302, Ranbir Penal Code. We have given our anxious thought to this aspect of the case. We think that section 326, Ranbir Penal Code is the appropriate section under which the accused should be convicted.[12]

23.14.7 Ante-mortem Injuries[13]

It might have been possible to draw that conclusion in an indirect manner if there were convincing evidence on the record on the second point, namely, that it was an ante-mortem injury which caused the child's death. As already stated, the post-mortem report is totally silent as to whether the doctor adopted any method for arriving at this important conclusion. In his cross-examination he admitted that the following six signs establish an ante-mortem injury: (1) haemorrhage, more or less copious and generally arterial, (2) marks of sprouting of blood from arteries, (3) clotted blood, (4) deep staining of the edges and cellular tissues, which is not removed by washing, (5) the edges gap owing to the reaction of the skin and muscle fibres, and (6)

11. *Kanhaiyalal Sewaram v State of Madhya Bharat*, 1954 Cr LJ 6 : AIR 1953 MB 37 : ILR 1953 MB 193. **Also see**: *Chinnathambi (in re:)*, (1952) 2 Mad LJ 550: AIR 1953 Mad 239: 1953 Cr LJ 449 (Mad).
12. *Isher Dass v State of Jammu and Kashmir*, 1954 Cr LJ 505 : AIR 1954 J&K 19 : 10 J&K LR 1.
13. *Vidyamati v State of Himachal Pradesh*, 1952 Cr LJ 33 : AIR 1951 Pepsu 1 : AIR 1951 HP 82.

inflammation and reparative processes. He admitted that, except for sign No. (3) the remaining five signs were absent in the present case. In other words, there were only 17% chances of the injury in question having been caused ante-mortem, while there were 83% chances of its having been caused post-mortem. The medical evidence being thus so overwhelmingly in support of the injury being a post-mortem one, it "would be most unsafe to draw any conclusion from mere conjectures. One such conjecture would be that the appellant would not cause such an injury to the child if it were dead. The learned counsel for the appellant stated that she had given a plausible explanation for that in her confession. For reason already recorded, the confession cannot be looked into, but the explanation can certainly be considered even though it emanates from the appellant's counsel. The explanation given was that the appellant had been advised by her paramour to cut the child because in that way the decomposition would be accelerated. It is immaterial whether any such suggestion had in fact been made to the appellant, or whether it would have worked, it is, however, not beyond the bounds of possibility that the cut may have been inflicted on the infant on the said supposition. It is also possible that the head may have been severed from the body in order to bury the two separately as a safeguard against detection. It is noteworthy that there is no evidence that the body and the head had been buried at one and the same place. When they were discovered they were found at a few feet one from the other. The mere fact, therefore that the head of the child had been severed from the body with some sharp weapon did not lead necessarily to the conclusion that the severance was caused by the infliction of an ante-mortem injury.[13]

23.14.8 Putrefaction[14]

The accused has appealed from jail. The perusal of the record shows that the legality of conviction under section 304(II) is open to question. The body of the deceased was in a decomposed state, at the time of the post-mortem examination. The medical witness could not give any definite opinion as to the cause of death though he expressed the opinion that most probably death was due to the rupture of the spleen. Rupture, he thought, could be caused by striking with a piece of wood or even by a fall particularly if the spleen is enlarged. So advanced was the stage of decomposition that no external injury could be seen.

The opinion that death was in all probability due to the rupture of the spleen particularly if it was enlarged is more in the nature of a hazardous guess than anything else. The fact, therefore, remains that the cause of death could not be found. In these circumstances, conviction under section 304(II) would not be legal. If injuries caused by the accused are not shown to have caused death, the cause would not be covered by section 304(II). It would be equally difficult to place it under section 325, Penal Code as the nature of the injuries is not proved. The accused admits beating. A conviction under section 323, Penal Code is all that is possible in these circumstances.[14]

23.14.9 Drowning[15]

Though the boy was last seen in the morning of 15-11-54, and died according to the prosecution case, on that day, the F.I.R. (E.T. 3) was lodged at Biopartiguda P.S. in the midnight of 21-11-54 six days after the alleged occurrence. The body was removed by the investigating officer (P.W. 17), after being shown the place by the appellant at about 3 am on 22-11-54. The post-mortem examination was held by the medical officer (P.W. 7) at 1 pm on 22-11-54, that is, a week after the alleged occurrence. He found one incised wound at the lower part of the right ear which had cut the internal carotid artery and its neighbouring muscles. There was another incised wound at the right side of the neck lower to the first injury. The post-mortem

14. *Lianthlira v State of Assam,* 1952 Cr LJ 1272.
15. *Adi Bhumiani v State of Orissa*, 1957 Cr LJ 1152 : AIR 1957 Ori 216 : 23 Cut LT 180.

report (Ext. 2) also discloses a sign of ecchymosis at the upper laryngeal part and the body of the hyoid bone as found to be grooved as an effect of some external violent pressure by some fingers. There were also four small simple injuries, one incised wound on the lower part of the chin, a lacerated wound at the distal part of the left tibia, an incised wound at the right iliac region, and a patch of ecchymosis at the left side of the forehead. According to the medical officer (P.W. 7), death was due to shock, haemorrhage and asphyxia. The post-mortem report also discloses that the body was moderately built but swollen, decomposition set in, the cuticle had peeled off, *rigor mortis* was present, eyes were closed, the tongue was protruded, dried mud was present on hands, legs and hair, and hands and feet were wrinkled and bleached. Brain substance was decomposed. Decomposition commenced in the right and the left lungs. The heart was empty and the stomach was empty. But curiously enough Ext. 2 does not contain the opinion of the medical officer whether the injuries found on the body were ante-mortem or post-mortem. One would naturally expect, as it is the object of the post-mortem examination, that the essential thing to be noted in the post-mortem report is whether the injuries are ante-mortem or post-mortem. After the post-mortem report was received by the police the medical officer was again asked to state whether the injuries were ante-mortem or post-mortem and then it was stated by the medical officer that the injuries except one or two were ante-mortem. P.W. 7 in his evidence stated that all the seven external injuries were ante-mortem in nature. But, in cross-examination, he admitted that he had not mentioned so in his post-mortem report and when the police sent a requisition to him on 26-11-54 he opined that except injury Nos. 4 and 6 others were ante-mortem in nature and that he based his conclusion on the post-mortem report. Injury No. 4 is a lacerated wound at the distal part of the left tibia and injury No. 6 is a patch of ecchymosis at the left side of the forehead. He also stated that *rigour mortis* starts after two hours of the death and continues for over seven hours and sometimes it lasts for 2 or 3 days; and that it again starts and vanishes when the body starts decomposing. He also stated that on the region of injury No. 7, a sign of ecchymosis at the upper laryngeal part, he did not find any finger impression. On this evidence of the medical officer and Ext. 2 (the post-mortem report) as also the inquest report (Ext. 4) the learned Sessions Judge came to the conclusion that the injuries were ante-mortem. The learned counsel for the appellant contends that the learned Sessions Judge had not given due weight to the non-mention of that fact by the medical officer in the post-mortem report which was, in the usual course of things, his first duty to state and also that the injuries present can be post-mortem injuries as the dead body was decomposed. In support of his contention he relies upon a passage in *Modi's Medical Jurisprudence and Toxicology*, 12th Edn., at p 133:

> *Owing to the formation of these gases under the skin blisters containing a reddish coloured fluid form on the various parts of the body. When these burst, the cuticle being softened peels off easily. Bruises and abrasions may become unrecognizable when the cuticle is denuded. Wounds, whether caused before or after death, begin to bleed once more owing to the pressure of gas within the heart and blood vessels, wounds also become so altered in appearance that it may be difficult to form an opinion as to whether they were caused before or after death, unless the presence of the clotted blood can be distinctly made-out.*

At p 137, it is stated:

> *The rate of putrefaction of a body in water is more reliable than that of a body exposed to the air or interned, as the temperature of the water is more uniform, and the body is protected from the air, as long as it remains sub-merged in water... Putrefaction is accelerated when once a body has been removed from water, as the tissues have imbibed much fluid. In such a body decomposition is so rapid, that the changes occurring in twenty-four hours exposure to the air will be more marked than those ordinarily resulting from a fortnight's further submersion.*

No doubt, in the case of death by drowning, asphyxia is a common cause in the majority of cases, as water getting into the lungs gets churned up with air and mucus, and produces a fine froth which blocks the air vesicles. It is also stated by Modi at p 170.

> *Occasionally, death may occur from asphyxia caused by laryngeal spasm set up by a small amount of water entering the larynx. In such a case water does not enter the lungs and the signs of drowning will be absent.*

He also states at the same page that shock is brought about by fright or terror, or it may be caused during a fall, the water striking against the chest and pit of the stomach; and that if water is very cold, it may induce shock through the recurrent laryngeal or trigeminal nerves, which reflexively inhibit the action of the heart and lungs and death may also be caused by syncope which may occur in persons suffering from epilepsy by falling suddenly into cold water. Modi also says at p 175:

> *On the other hand, water may not be present in the stomach, if the person died from syncope or shock, or became unconscious immediately after falling into water, so that he could not struggle and swallow water in the act of drowning. There will also be no water in the stomach, if it is present in the stomach, is forced out by the pressure of the gases of decomposition.*

Taylor in his *Principles and Practice of Medical Jurisprudence*, Vol 1, 10th Edn., at p 554, under the heading 'Was drowning the result of accident, suicide or homicide." says:

> *A person may be suffocated, or may die from epilepsy, apoplexy, or from a sudden attack of any other fatal disease which may or may not be indicated by well marked appearances after death; the body is thrown into or falls into water, and remains there a few days. When taken out, water may be found in the lungs, but there may be none in the stomach; there may be no mucus froth in the windpipe, and the lungs may be more or less congested. In the case of a suffocated body without marks of external violence, it would be impossible to determine whether death has actually taken place within the water or not, since persons may die in water or at the moment of immersion, in circumstances in which the appearances of drowning would be either obscure or entirely wanting.*

There is no reason why an adult should not be standing close to the water and fall in when taken with a fatal attack of the disease.

Thus, from the evidence of the medical officer and the post-mortem report, it cannot be said beyond the possibility of all reasonable doubt that the body of the deceased was thrown into the stream after he was killed. The learned Sessions Judge held that the injuries found on the deceased were ante-mortem. He relied upon the medical evidence as also the recovery of the knife (M.O. III) from the house of the appellant's father at Mundiguda to arrive at this conclusion. M.O. III is the knife used for cutting vegetable and identified by P.Ws. 1 and 2 as theirs. It is quite likely that the accused might have had the knife with her at the time of taking the boy to his grand-father's house. He also relied upon the inquest report (Ext. 4) showing that the persons present there noticed three big stabbing wounds respectively at the lower part of the right ear, at the right side of the neck and the lower part of the chin. According to that report, nine persons who attested were of opinion that death was caused by some sharp instrument and the evidence of P.Ws. 9, 11 and 12 was also relied upon to the effect that the dead body disclosed marks of stabbing wounds. The learned Sessions Judge, in my opinion, erred in relying on the statements of nine persons who attested the inquest report that death was caused by some sharp instrument. He also erred in relying upon the inquest report (Ext. 4) in coming to the conclusion that body disclosed marks of stabbing wounds. The evidence of P.W. 9 no doubt should be remembered that he admitted having searched for the body in Tenda Khunto Munda prior to this day. P.W. 11 is the separated younger brother of Pursottam (P.W. 1) and he did not state in his evidence before the learned Sessions Judge that the dead body which was recovered from underneath the water, bore any stab marks though he categorically admitted in his evidence that he was present when the dead body was recovered. The learned Sessions Judge evidently committed an error of record in relying upon the evidence of P.W. 11 that the dead body bore the injuries at the time of its being recovered. P.W. 12 was not examined by the prosecution but was only tendered for cross-examination. He stated that he was present when the dead body was recovered but did not say anything about the existence of the injuries on the dead body at the time when it was recovered. In relying

upon his evidence also the learned Sessions Judge evidently committed an error of record. Practically, the learned Sessions Judge seems to have relied upon the statements contained in the inquest report to arrive at this conclusion. They are not substantive evidence and ought not to have been relied upon by the learned Sessions Judge. On a consideration of the post-mortem report and the evidence of the medical officer especially in view of the fact that it was not noted in the first instance in the post-mortem report that the injuries found on the body are ante-mortem coupled with the statement of Modi in his book on *Medical Jurisprudence* that after putrefaction sets in it is difficult to say from the injuries whether they are ante-mortem or post-mortem. I am of opinion that it cannot be definitely established in this case that the injuries are ante-mortem.

23.14.10 Identity of the Dead — Skull Super-Imposition[16]

The next question is, was it the corpse of Bai Dhanu? We have already discussed the evidence so far as the identity of the corpse is concerned. The corpse was identified to be of Bai Dhanu from the four red plastic bangles and the hair-pin found on the corpse by P.W. 3 Suman Bhaga. From the length of the hair and the find of the hair-pin it could be reasonably inferred that the corpse was of a female. The evidence of P.W. 2 Dr. Barot shows that the bones of the skeleton were packed and sealed in a wooden box and were handed over to the Investigation Officer for the purpose of obtaining the opinion of the Forensic Expert. The forwarding letter, Exhibit 61 shows that the said sealed box was sent to the Director, Central Forensic Science Laboratory, Calcutta, for examination and report. The report received from the Forensic Laboratory is at Exh. 62. Exhs. 64 to 66 are the correspondence on the subject. Now the report of the Forensic expert shows that the hair on the skeleton were identified to be of a human being probably derived from a female. From the hair it was not possible to ascertain the age of the victim. However, on the examination of the bones it was ascertained that they belonged to a female. So far as the question of age is concerned, according to the opinion of the Expert the deceased was of the age group of 20 to 26 years. If we turn to the statement of the appellant recorded under section 313 of the Code of Criminal Procedure, we find his age to be 22 years. His wife must, therefore, be around 20 years of age. As we have pointed out earlier, the enlarged photograph of Bai Dhanu was also forwarded to the Forensic Expert. By his report dated 19 February 1979, which is part of Exh. 62 on the basis of the ratios derived from the measurements of the distance between various anatomical landmarks on the photograph of the skull with mandible as well as on the photograph of the face of Dhanu, the Expert opined that there was a striking correspondence between the mandible and the photograph of the face of Bai Dhanu. The details of these measurements are also found in the said report. From the above evidence two things become abundantly clear, namely: (i) the skeleton was of a female above 20 years but under 26 years of age and, (ii) the measurements of the skull with the mandible of the skeleton when superimposed on the photograph of the face of Dhanu showed a striking correspondence between the two.

It was, however, vehemently argued by Mr. Padia, the learned advocate for the accused, that these findings would raise a suspicion that the skeleton was of Bai Dhanu but a conviction for murder could not be based on a mere suspicion. Mr. Mehta on the other hand contended that once the court finds that the skeleton was of a female about 20 years of age and under 26 years of age from the opinion of the Forensic Expert, the court should have no hesitation in concluding that the skeleton was of Bai Dhanu in view of the find of four bangles and a hair-pin on the corpse, which according to the evidence of the prosecution witnesses, Bai Dhanu usually wore. Mr. Mehta further submitted that in addition to this evidence the conduct of the appellant must also be borne in mind by the court. The prosecution allegation is that the

16. *State of Assam v Upendra Nath Rajkhowa*, 1975 Cr LJ 354.

relations between Bai Dhanu and the appellant were strained because the appellant was keen to get rid of Dhanu as he wanted to marry Manjula. Bai Dhanu was last seen with the appellant in the hutment on the night of 11 December 1978 when they retired to bed. Next morning she was found missing and the appellant trotted out an explanation that she had eloped with some Bhaija. However, the subsequent conduct of the appellant in getting engaged to Manjula post-haste betrays knowledge on his part that Dhanu was no more in this world. Even though the foul smell was emitting from his Navania he remained totally inactive and did not try to ascertain the reason for the foul smell. That also shows that he was aware that the decomposed body of his unfortunate wife was giving out the foul smell. In addition, the evidence discloses that he pledged the silver ornaments through Chhotu Uka soon after the disappearance of Bai Dhanu. The appellant had not given any report to the police at the point of time that his wife was missing. He also offers no explanation regarding the find of the corpse from his Navania. In fact, he goes to the length of disputing his marriage with Dhanu. From all these facts Mr. Mehta submitted that it was safe to infer that the corpse found from his Navania was of Dhanu and none else. We have already dealt with each and every circumstance on which the prosecution relies. We have come to the conclusion that all the circumstances which were mentioned by Mr. Mehta in the course of his submissions have been established beyond reasonable doubt by the prosecution. The only question which now remains to be considered is whether the corpse found from the Navania of the appellant was of his wife, Dhanu.[16]

23.14.11 Skull Super-imposition[17]

Lastly, on the question of the identity of the dead bodies, we come to the expert's evidence.

P.W. 35 is Dr. J.K. Barua. He was Director of Forensic Science Laboratory, Assam in 1970. He is an M.Sc. in Chemistry, Ph.D. in Bio-Chemistry and has a law degree. He had undertaken 3 year's training course in Bio-Chemistry in the National Orthopaedic Institute of London and obtained Ph.D. there. Before becoming Director he was Bio-Chemist in the Pasteur Institute of Shillong. Forensic Laboratory in Assam was established on 2 April 1969 and it started functioning in July, 1970. He came to Dhubri on 14 August 1970 and examined four skeletons remains at morgue of Dhubri. P.W. 35 deposed that the skeletons appeared to him to be of female at the first impression (the witness deposed from a Register). P.W. 35 then looked into the sternum which were found to be of female origin as manubrium portion of the sternum was more than the half of length the entire sternum. He also observed that the pelvic bone cavity was of ovoid structure and the sacrum of the vertebral column was wider in shape and *coccyx* pendulas. In one body there was a union of manubrium with the rest of the sternum body *i.e.*, the entire sternum had fused into one. He also found four braids of long hairs near each skull of four bodies. From the examination, P.W. 35 came to the conclusion that all the bodies were females.

P.W. 35 with the help of his assistants and hospital sweepers cleaned the skulls and also some long bones from each of the dead bodies and packed them and put them in separate packets marking the packets as A, B, C and D. Thereafter they cleaned the skulls and bones in laboratory and examined the humerus bones for ascertaining the height of each of the dead bodies. From his examination we find that the dead body, the bones of which are in packet 'A' was 153.56 cm., in height, the dead body, the bones of which are in packet 'B' was 157.426 cm., the dead body, the bones of which are in packet 'C' was 150.37 cm. and the dead body, the bones of which are in packet 'D' was 156.75 cm. in height. He then took the photographs of the four skulls and they were marked A, B, C and D as per the packet marks. Negatives of the skulls were developed and enlarged prints of those negatives were made to correspond with the life size of skull.

17. *State of Assam v Upendra Nath Rajkhowa*, 1975 Cr LJ 354.

Material Ext. 14 is the group photo of Mr. Rajkhowa, Mrs. Rajkhowa and the three daughters in the group photo Ext. 14 the photo of Mrs. Rajkhowa was marked (1), that of Miss. Linu was marked (2), that of Miss. Luna was marked (3) and that of Miss Bhantu was marked (4). Then they took photograph of the four faces of photos (1), (2) (3) and (4). From the negatives they made enlargement to as near as life size enlargement. The skull found in packet 'A' was marked as (1), that in Packet 'B' marked as (2) that in packet 'C' marked as (3) and that in packet 'D' marked as (4). After so marking they sent these skulls to the Director, Central Forensic Science Laboratory, Calcutta. The braids of hairs, bottles of soil samples, and the group photo material Ext. 14 were also sent to the same officer. P.W. 35 after preliminary examination agreed with the opinion of the surgeon who held the post-mortem regarding the sex. Regarding the identification of skull, he identified the skull 'A' to be that of (1) in Material Ext. 14, 'B' to be of (2) in Material Ext. 14, 'C' to be of (3) in Material Ext. 14, 'D' to be of (4) in Material Ext. 14. The witness has stated sacrum is the end portion of the vertebral column. Female sacrum is wider than that of male. Sternum became fused with the main body at the age of 35 and above. Since the witness has stated that there was union of manubrium with the rest of the sternum body, that is, the entire sternum had fused into one in one skull it is found that one skull belonged to a person of 35 years or more. The witness also has stated that the age of person referable to skull No. 4 would be above 18 years.

In cross-examination P.W. 35 has stated that this was their first examination of the skeletons in the institute and the magistrate had required him to do the examination and he received the requisition (Ext. 23) at Gauhati. He received the group photo from the magistrate. He had not known Mrs. Rajkhowa and her daughters personally. He had established the identity by comparing the face photos with the photos of the skulls. He had found the data to be correct upto 90%. But he wanted to be 100% sure and so he sent the skulls to the Central Forensic Science Laboratory. The witness has stated that identification could be established by anthropometric measurement, that is, by measuring selected distances between different facial anatomical landmarks and finding out their ratios. For this the photos need not be enlarged to life size. To avoid mistakes the skulls and photos were enlarged as much as possible to life size. In sternum there were five pieces of bones. He had inspected the manubrium and when he found that its length was more than half of body length of sternum, he concluded that it belonged to a female body. The witness also has stated that the male skull differs from female skull in many respects.

At pp 27-28 of Modi's *Medical Jurisprudence and Toxicology*, Seventeenth Edition, we found the following:

> *The sternum in the female is shorter and its upper margin is on a level with the lower part of the body of the third thoracic (dorsal) vertebra, while in the male it is on a level with the lower part of the body of the second. The sternal body is less than twice the length of the manubrium in the female. While, it is more than twice its length in the male. This is due to the fact that the manubrium in the male is somewhat smaller than that in the female. The ribs are thinner and have a greater curvature, and the costal arches are larger.*

The pelvis affords best marked and most reliable characteristics for distinguishing sex in over 90% of subjects. The female pelvis is shallower, wider, smoother and less massive than the male pelvis. The ilia in the female are less sloped, their posterior borders, are more rounded, the anterior superior iliac spines are more widely separated and the great sciatic notches are much wider, forming almost a right angle than in the male. The female sacrum is short and wide, and is sharply curved forward in its lower half, while the male sacrum is long and narrow, has a uniform curvature along its whole length and may have more than five segments."

P.W. 21 Basudev Bhattacharjee is the Assistant Director, Central Forensic Science Laboratory-Cum-Assistant Chemical Examiner he had deposed that he has been Assistant Director since February, 1968 and before that he was a Junior Scientific Officer of Central Forensic Laboratory. He is an M.Sc. in Zoology and Comparative Anatomy. He has acquired

experience under the then Assistant Director for examination of biological materials including photographic super-imposition. On 31-10-70 he received 9 parcels from the Director, Forensic Science Laboratory, Assam, under Memo. No. F.S.L. IV/67/70/984, dated 27-10-70 in connection with the present case. In his deposition he has given the details of the articles received in those 9 parcels. On examining the articles he stated the result of his examination as follows:

> Each of the four samples of hair contained in packets marked 1(b), 2(b), (3)(b) and 4(b) respectively was identified to be human head hair probably derived from adult female.

Neither arsenic nor any metallic poison could be detected in the hair samples sent for examination. The report on photographic super-imposition of skull of each of the four skulls is as under:

(a) There was a correspondence between the anatomical landmarks of the skull marked 'I' (M. Ext. 18) and the photograph of the deceased face marked (1) in the group photograph (M. Ext. 14) when photographically super-imposed. It is, therefore, concluded that skull in question marked 'I' could have been the skull of deceased person shown as (1) in photograph (M. Ext. 14).

(b) There was a correspondence between the anatomical landmarks of the skull marked '2' (M. Ext. 20) and the photograph of the deceased face marked (2) in group photograph when photographically super-imposed. It is, therefore, concluded that the skull in question marked '2' could have been the skull of deceased person shown as (2) in the photograph (M. Ext. 14).

(c) There was a correspondence between the anatomical land marks of the skull marked '3' (M. Ext. 22) and the photograph of the deceased marked (3) in group photograph (M. Ext. 14) when photographically super-imposed. It is, therefore, concluded that the skull in question could have been the skull of deceased person shown in the group photograph as (3).

(d) There was a correspondence between the anatomical landmarks of skull marked '4' and the photograph of deceased face marked (4) in group photograph when photographically super-imposed. It is therefore concluded that the skull in question could have been the skull of a deceased person shown in the photograph as (4).

The report submitted by P.W. 21 to the Director, Forensic Science Laboratory, Assam in Ext. 25.

P.W. 21 has stated that in case of skull No. 1 with photo marked (1) in M. Ext. 14 there was a correspondence of Nasion point, sub-nasion point, prosthion, the canthuses molar prominence. By Nasion is actually meant a point where the two nasal bones meet the frontal bone. By sub-nasion is meant the uppermost point below the nasal aperture where the two maxillae unite at the mid segittal plane is the skull. Prasthian in the lower-most point of maxilla at the mid seggittal plane. Canthuses are epicanthus and indocanthus, which correspond to outer and inner angle of eye. The cheek bones are molar prominences. The above correspondence was found in respect of all other skulls and photos.

Shri R.C. Bannerjee (P.W. 22) the photographic expert took the photos. Shri Bannerjee had measured the anatomical landmarks of the skull and photos in his presence. After getting the measurements, they arrived at certain ratios and Shri Bannerjee arrived at those figures. In the skulls the anatomical landmarks are at a particular distance from each other. If identical differences in the photos are found there is a further help in establishing the identity of the deceased. Mr. Banerjee had sent his report to him (P.W. 21). The ratios indicated a striking correspondence between the skulls and their respective photos thereby leading them to believe that the skulls were of the same person whose respective photographs were examined by them.

Dr. W.M. Crogman in his book *Human Skeleton in Forensic Medicine*, has recommended a skull photograph comparison whenever possible making allowances for a degree of non-comparability in the head positioning in the photographs as relating to far more precisely oriented cranial positions. Important corroborative and possible conclusive evidence may thus be established.

In cross-examination P.W. 21 has stated in their laboratory other examinations are also conducted. Superimposition is one of the methods of identification. There are surer means of identification—in general than superimposition. In this case he had only received the skulls. If other pieces of skeletons would have been sent to them they would have been in a position to give age, sex and height of the person. They had definite instructions to find out identity by superimposition. The term superimposition means the comparison of skull with a photo and superimposition would mean 2 photographs being combined in one—these two photos are of 2 existing things. They are then brought to the same plane and enlarged to the same size for purpose of comparison. He did not get a perfect contour of the skulls as lower jaws were missing in the skulls and some portion of bony fragments were also missing in all the skulls. The original contour was therefore partially missing (absent). The degree of partially missing bone was negligible in the present case as immovable bones were not missing and lower jaw is a movable one only. It could not have been possible to know about the position of lower jaw from the photographs. The absence of lower jaw would alter the contour partially. Superimposition would not be imperfect, even if lower jaw is missing. It is not a fact that superimposition would be erroneous in such a case. The skulls were marked (1) to (4) as in group photos by the sending authorities. Nobody of the sending authority was personally present at time of super-imposition for identification. He had taken part in measurements of the anatomical land marks. He agreed that measurement in skulls were bigger than the measurements in the photos. So the skulls and photos were not brought to the same size. It was however necessary to have done so. In this case the image of the skull was brought to the size of the photo—though this has not been mentioned in his report. Mr. Bannerjee had enlarged the photo of the face from group photo. He stated that it was not a fact that the skull and the face-photo were not adjusted to same plane. That the negative test of superimposition is more empathic than a positive test.

P.W. 22 is Ram Chandra Banerjee. He is Scientific Assistant of Central Forensic Science Laboratory. He knew P.W. 21, Mr. Bhattacharjee. He had helped him in preparing a report. He had seen the skulls received in their laboratory. He took measurement of anatomical land marks of all the skulls. In his deposition he has given the various measurements. P.W. 22 stated that he arrived at the ratio by dividing the length of two anatomical points in a line with another anatomical points in the line. The witness explained the ratio given in his deposition.

Considering the evidence of P.W.s 21 and 22 we are inclined to hold that though the superimposition in the instant case is not perfect we find that the ratios indicated a striking correspondence between the skulls and their respective photographs thereby leading to the conclusion that the skulls were of the same persons whose respective photographs were found in M. Ext. 14.

23.14.12 Skull Superimposed Photographs Admissible[18]

There was some argument before the Sessions Judge and the High Court as regards the admissibility in evidence of the superimposed photograph as a means of identifying the skeleton as that of the deceased and it is this legal objection raised by the appellant that forms the ground of the certificate granted by the learned judges of the High Court. Learned counsel

18. *Ram Lochan Ahir v State of West Bengal*, AIR 1963 SC 1074 : 1964 Mad LJ (Cri) 19 : (1963) 2 Cr LJ 170 (SC).

urged before us that the superimposed photograph was not admissible in evidence and that its reception vitiated the verdict of the jury. We are clearly of the opinion that even if this photograph was not admissible in evidence the verdict of the jury and the conviction of the appellant could not be set aside because there was very cogent other evidence to prove the identity of the skeleton. Since, however the learned judges of the High Court have thought fit to grant a certificate, though they were themselves conscious of the fact that besides the photographs there was plenty of the other evidence to sustain the conviction, we consider it proper to express our opinion on the question.

The process adopted for taking the superimposed photograph is explained by P.W. 18, the assistant chemical examiner of the West Bengal Government was this: He first got a photograph of Pancham Sukla. This was photographed, the negative being taken on a quarter plate and the negative was enlarged. He got the skull and as the skull was broken in some parts the bones were pieced together and an enlarged photograph of the skull as reconstructed was taken. A negative of this was enlarged to the same size as the negative of the photo of the deceased with the angle and positions of the two being identical. The two negatives were then superimposed. For the superimposition the technique employed by him was thus explained:

> The ground glass of the camera was taken out, the negative of the photograph alleged of Pancham Sukla was placed on it, prominent markings of the negative were carefully jotted down on the ground glass, the markings being the following, *viz.*, nasion-nasomental line, malar bone prominences and two outer canthuses and two inner canthuses of the two eye balls and the inner ends of the supra orbital ridges, thereafter the ground glass was fitted in the camera, the skull was so orientated that all the points of the skull came in exact position with the markings made on the ground glass as mentioned when the photograph of the skull was taken; then the two negatives were placed by aligning in such way that all the points as mentioned above corresponded on a sensitive bromide paper under an enlarger. The resultant is the photograph submitted to the court.The photographer who executed this work under the supervision of P.W. 18 was Tapendra Nath Majumdar, who was examined as P.W. 19. This superimposed photograph showed the shape and contour of the bones of the face underneath the face as it looked when the deceased was alive, and the prosecution sought by means of this document to establish the identity of the skull as that of the deceased, or in any event to dispel any positive argument for the defence that the skull was not that of the deceased.

The contention urged before us by learned counsel was that this photograph was not admissible under any section of the Indian Evidence Act. If learned counsel is right here, he could succeed in having this evidence rejected as inadmissible. We are, however, clearly of the opinion that it is admissible in evidence under section 9 of the Evidence Act, the section reads:

> Facts necessary to explain or introduce a fact in issue or relevant fact or which support or rebut an inference suggested by a fact in issue or relevant fact, or which establish the identity of anything or person whose identity is relevant, or fix the time or place at which any fact in issue or relevant fact happened, or which show the relation of parties by whom any such fact was transacted, are relevant insofar as they are necessary for the purpose.

The question at issue in the case is the identity of the skeleton. That identity could be established by its physical or visual examination with reference to any peculiar features in it which would mark it out as belonging to the person whose bones or skeleton it is stated to be. Similarly the size of the bones, their angularity or curvature, the prominences or the recessions would be features which on examination and comparison might serve to establish the "identity of a thing" within the meaning of section 9. What we have in the present case is first a photograph of that skull. That a photograph of the deceased was admissible in evidence to prove his facial features, where these are facts in issue or relevant facts, is also beyond controversy. Now what P.W. 18 with the assistance of P.W. 19 has done is to combine these two. The outlines of the skull which is seen in the superimposed photograph show the nasion prominences, the width of the jaw bones and their shape, the general contours of the cheek bones, the position of the eye cavity and the comparison of these with the contours, of the face of the deceased as seen in

the photograph serve to prove that features found in the skull and features in the bones of the face of the deceased are identical or at least not dissimilar. It appears to us that such evidence would clearly be within section 9 of the Evidence Act.

The learned counsel for the appellant urged that the superimposed photograph was not a photograph of anything in existence and was for that reason not admissible in evidence. This argument proceeds on a fallacy. In the first place, a superimposed photograph is not any trick photograph seeking to make something appear different from what it is in reality. There is no distortion of truth involved in it or attempted by it. A superimposed photograph is really two photographs merged into one or rather one photograph seen beneath the other. Both the photographs are existing things and they are superimposed or brought into the same plane enlarged to the same size for the purpose of comparison. Possibly some illustrations might make this point clear. For instance, if the photo of the deceased when alive were printed on a transparent medium and that were placed above a photograph of the skull— both being of the same size—the visual picture seen of the two together would be approximate to the document objected as inadmissible. In the above, it would be seen both the photographs would be admissible in evidence and no objection could be taken to their being examined together. Again for instance, if instead of a two-dimensional photograph we had first a hollow model of the head of the deceased say of transparent or semi-transparent material, constructed or made from a photograph, that certainly would be admissible in evidence provided there was proof that the model was exactly and accurately made. If the model were dismantled into segments and placed upon the skull with a view to show that the curves and angles, the prominences or depressions, exactly corresponded, there could be no dispute that it would be a perfect method of establishing identity. If this were granted the superimposed photograph which is merely a substitute for the experiment with the model which we have just now described would be equally admissible as evidence to establish the identity of a thing. It was pointed out that this was the first occasion that in India an identity of a skeleton was sought to be established by means of superimposed photographs and that P.W. 18 had done this experiment by reference to what he had read in the books on the subject and that on that ground the evidence could not be accepted. Any deficiency in scientific accuracy might go to the weight of the evidence which in the case on hand was a matter for the jury to consider, but we are now only on a very narrow question as to whether it is excluded from evidence as inadmissible. Our answer is that it was admissible in evidence.

23.14.13 Bladder and Stomach Contents (Time of Death)[19]

Another circumstance which has been magnified by the learned Additional Sessions Judge is the discovery at the time of post-mortem of not less than 2 Ibs. of semi-digested food in the stomach and 12 ounces of urine in the bladder of the deceased Gurdit Singh. It is said that this circumstance demonstrates that the said deceased must have taken his food and must be sleeping when he was murdered, for if he was murdered at 5.30 pm as the witnesses deposed, there would not have been such semi-digested food in the stomach of the deceased or such a large quantity of urine in his bladder. The High Court pointed out that the said circumstances cannot afford a reliable basis for ascertaining the time of death, particularly when there is nothing on the record to show that the deceased had not taken any food a couple of hours before he was attacked. Apart from the fact that the time required to digest food varies depending upon the nature of the food taken, the digestive capacity of the individual concerned and his health at a particular time, it is also not possible to rely upon such evidence unless there is some definite evidence that the deceased had not taken any substantial food within a few hours

19. *Nihal Singh v State of Punjab*, AIR 1965 SC 26 : 1965 (1) SCJ 160 : 1965 (1) Cr LJ 105 (SC). **Also see**: *Ambika Prasad v State (Delhi Adm.)*, AIR 2000 SC 718 : 2000 Cr LJ 810 : 2000 AIR SCW 253 (SC); *Satbir Singh v State of Haryana*, 1995 Cr LJ 739 : 1995 (2) Cri CJ 395 : 1995 (2) Crimes 777.

before his death. Without such definite data, a court cannot come to any conclusion on the general habit of villagers taking lunch at 1 pm and dinner at 7 pm. The capacity to retain urine for a longer time than usual depends upon individual habits. That apart, this aspect of the case was not pursued in the cross-examination of the doctor and no question was put to her on the basis of the said two factors. The High Court was, therefore right in holding that the learned Additional Sessions Judge was wrong in giving undue importance to the said circumstances.

23.14.14 Digestion Time Variable: (No guide to TOD)[20]

The learned counsel for the appellants pointed out that the doctor who performed the post-mortem examination of the corpses, found partially digested rice in the stomach of the two deceased persons, and he urged that from this it would be inferred that the occurrence must have taken place sometime at night after the deceased persons had taken their evening meals together. This argument again raises a question of fact which the High Court has not omitted to consider. It may, however, be stated that a reference in books on medical jurisprudence shows that there are many factors affecting one's digestion, and cases were cited before us in which rice was not fully digested even though considerable time had elapsed since the last meal was taken. There are also no data before us to show when the two deceased persons took their last meal, and what article of food, if any, was taken by them along with rice. The finding of the doctor, therefore, does not necessarily affect the prosecution case as to the time of occurrence.

23.14.15 TOD from Food Digestion[21]

The contention of counsel for the respondents before us, which has received judicial reinforcement by acceptance by the Sessions Judge, is that this first information is a product of many minds manipulating to make it, and the apparently short, honest interval between the occurrence and the report to the Patil is a make-believe, the death having occurred beyond doubt at about 2.00 pm and not at 5.30 pm as the prosecution disingenuously pleads. Reliance is primarily placed for this preclocking of the occurrence on the post-mortem certificate, doctor's evidence and the medical expertise contained in Modi's *Medical Jurisprudence*. Admittedly, 'semi-digested solid food particles, were observed in the deceased's stomach by P.W. 4, the medical officer, and the inference sought to be too neatly drawn there from is that the man must have come by his end (and that the digestive process must also have come to a halt with it) 2 to 3 hours after his last lunch, which, according to P.W. 2, was at 10.00 am. If he did die before 2.00 pm, everything else in the prosecution evidence became suspect, argued the court. The assurance of this assertion, however, turns on the exact accuracy, in terms of the I.S.T., of the testimony of P.W. 5 who swore that himself and the deceased had taken food on the fateful day at about 10.00 am before setting out for Bibi. The sluggish chronometric sense of the country-side community in India is notorious since time is hardly of the essence of their slow life; and even urban folk make mistakes about time when no particular reason to observe and remember the hour of minor event like taking a morning meal existed, 10.30 am could well have been an hour or more one way or the other and too much play on such slippery facts goes against realism so essential in a testimonial appraisal. More importantly, the court must not abandon a scientific attitude to medical science if it is not to be guilty of judicial superstition. To quote Modi's *Medical Jurisprudence* that food would be completely digested in four to five hours or to swear by the doctor to deduce that death must have occurred within 3 hours of the eating and, therefrom, to argue that the presence of undigested food in the dead body spells the sure inference that death must have occurred before 2.00 pm is to misread the science on

20. *Lachhman Singh v State of Punjab,* ILR 1952 Punj 278 : 1952 Cr LJ 863 (SC). **Also see**: *Basappa Bhimappa Doddamani v State of Mysore*, AIR 1961 Mys 21 : 1960 Mad LJ (Cri) 808 : (1961) 1 Cr LJ 120 (Mys); *Laloo v State of Rajasthan*, AIR 1953 Raj 214 : 1953 Cr LJ 1853 : ILR (1952) 2 Raj 602.
21. *Shivaji Sahebrao Bobade v State of Maharashtra*, AIR 1973 SC 2622 : 1973 Cr LJ 1783 : 1973 2 SCC 793.

the subject of digestive processes. Modi's *Medical Jurisprudence* extracts from which have been given by both the courts, makes out that a mixed diet of animal and vegetable foods, normally taken by Europeans, takes 4 to 5 hours for digestion while a vegetable diet, containing mostly farinaceous food usually consumed by Indian does not leave the stomach completely with 6 to 7 after its ingestion. Indeed, the learned author cautiously adds that the stomach contents cannot determine with precision the time of death "inasmuch as the power of digestibility may remain in abeyance for a long time in states of profound shock and coma". He also states "it must also be remembered that the process of digestion in normal healthy persons may continue for a time after death". The learned judges reminded themselves of the imponderables pointed out by Modi which makes the 'digestive' testimony inconclusive and, therefore, insufficient to contradict positive evidence, if any, about the time of death. To impute exactitude to a medical statement oblivious to the variables noticed by experts and changes in dietary habits is to be unfair to the science. We are not prepared to run the judicial risk of staking the whole verdict on nebulous medical observations. Given so according to P.W. 5 deceased took tea some time after 12.30 pm when they started for Bibi. At that time the possibility of his having had something to eat is not ruled out. If so, the medical evidence as to the time of death will not be inconsistent with the post-mortem findings.[21]

23.14.16 Putrefaction[22] (TOD indicator)

The next factor to be considered is decomposition, which according to the doctor had not yet set in. Here, the table regarding the chronological sequence of putrefactive changes in the temperate region on pp 127 and 128 of Modi's book the only change which could have been expected to take place within the period in question is that numbered 1, namely, greenish colouration over the iliac fossae and the eye-balls soft and yielding, the time for which is given as from 1 to 3 days after death. The item 2 in the table is apparently only expected to be seen from 3 to 5 days after death and in the present case even according to the prosecution, the post-mortem examination took place well within three days of the death. Here again, the external conditions would appear to be strongly in favour of late development of putrefaction. Four factors are enumerated by Mr. Modi at p 132, the 4th, namely manner of burial being irrelevant in the present case as the body was left lying in the open. The other three factors are warmth, moisture and air regarding which Mr. Modi has the following to say:

1. *Warmth*

   Putrefaction commences at a temperature about 50°F., and is most favoured between 70°F. and 100°F. and even upto 115°F. The rapidity of the change considerably lessens as the temperature advances above 100°F. It is altogether arrested below 32°F. and above 212°F. A high temperature accompanied by dry air generally retards putrefaction.

2. *Moisture*

   This is very essential for the occurrence of putrefaction, as the micro-organisms, which are the causative agents of decomposition thrive well in both heat and moisture. Hence, the organs which contain water decompose more rapidly than dry ones.

3. *Air*

   The presence of air promotes and its absence retards putrefaction. Closely fitting clothes on the body retard decomposition by excluding the air. Similarly, bodies placed in air-tight lead or zinc coffins resist putrefactive processes for a long period. Moist air favours putrefaction by diminishing evaporation, while dry air retards it. In the same way still air helps putrefaction, and air in motion retards it.

22. *Sucha Singh v State of Punjab*, AIR 1951 Shimla 283.

In the present case the body must have been in dry air and for not more than half the time at a temperature of over 70°F. The cause of death is certainly a factor in favour of the argument for the appellant as regards putrefaction, since at p 133 Mr. Modi has observed that putrefaction is hastened after death occurring from asphyxia; but even so, it cannot be denied that the general conditions favoured the slow development of putrefaction and were entirely different from those in which the development is at all rapid.

One other point relied on for the appellants was that some dark fluid blood was found by the doctor whereas normally one would expect the blood to have coagulated. It is, however, stated at p 520 of Vol 1, 10th edition of Taylor's *Principles and Practice of Medical Jurisprudence* that in case of death from asphyxia the blood is found fluid for an usually long time after death and it coagulates very slowly, owing amongst other factors to the excess of carbonic acid gas contained in it, and for the same reason it is very dark in colour.

In the circumstances, the statement of the doctor, which should not have been allowed to pass unchallenged by the prosecution or by the learned Sessions Judge, is not a sufficient reason for rejecting the whole of the prosecution evidence and it should be said that evidence as a whole amply establishes the guilt of both the accused.[22]

23.14.17 Rigor Mortis[23] (TOD)

1. This was the statement by the doctor who performed the post-mortem examination at 10 am on the 25th February that the time between death and the post-mortem examination was 24 to 48 hours. According to this statement, which seems to be a general expression of the opinion based on the fact that *rigor mortis* was still present in the legs and that decomposition has not yet set in, the prosecution case, as it stands, is that the murder took place about 61 hours before the post-mortem examination, whereas the statement of the doctor would set it at the extreme limit of 48 hours and it has, therefore, been seriously contended that on the basis of this statement alone it must be found that the whole prosecution case is a fabrication. If the statement were to be taken as literally true, it would no doubt put an end to the prosecution case, but actually the statement is only an expression of opinion which might have been modified if proper questions had been put to the doctor. No questions were put to the doctor in an effort to get him to qualify this estimate of the time of death. It would seem that the persons responsible for the conduct of the trial in the lower court were not properly applying their minds to the facts of the case, since if they had been, they would have at once realised the effect of the doctor's statement on the prosecution case and put further questions to him on the point. The counsel for the accused, of course might well have been content to let matters rest where they were.

Before dealing with the condition of the body as described by the doctor, it is necessary to describe, so far as they can be ascertained, the conditions under which the body is alleged to have remained lying undisturbed from the evening of the 22nd to the early afternoon of 24th February. The official tables disclose that during the period the temperature at the place ranged between a maximum of 80°F. The body was left under a shady tree, and it is unlikely that the body, at any time while it was lying at the spot, was for any considerable period exposed to the rays of the sun if at all.

The first point relied on by the counsel for the appellants was the doctor's statement that some signs of *rigor mortis* were still present in the legs. Regarding *rigor mortis*, J.P. Modi, in his textbook: *Medical Jurisprudence and Toxicology* at p 120 of 9th Edn., states:

23. *Sucha Singh v State of Punjab*, AIR 1951 Shimla 283.

> *The time of onset varies greatly in different cases, but the average period of its onset may be regarded as three to six hours after death in temperate climates, and it may take two or three hours to develop, and as regards duration in temperate regions,* rigor mortis *usually lasts for 2 to 3 days, though it may last several days, 9 days according to Casper, and three weeks according to Taylor. In Northern India, the usual duration of* rigor mortis *is 24 to 48 hours in winter and 18 to 36 hours in summer.*

This passage appears to be the principal basis of the doctor's estimate of the time between death and the post-mortem examination in the present case, and great reliance is also placed on it by the appellant's counsel. It is, however, clear from the subsequent remarks of Mr. Modi that it is hard to fix any definite limit. For instance, the deceased was about 17 years of age, and at p 121 Mr. Modi states:

> *Age*:—In adolescent and healthy adult bodies the occurrence of *rigor mortis* is slow, but well marked, while it is feeble and rapid in the bodies of children and old people.

As regards the manner of death, he says that *rigor mortis* sets in early, and disappears soon in deaths from diseases causing great exhaustion and wasting of the muscles, as in cholera, plague, typhus, typhoid, phthisis, cancer, uraemia and chronic Bright's disease but its onset is delayed in deaths occurring from pneumonia, *apoplexy*, asphyxia and nervous diseases causing paralysis of the muscles. Perhaps most important, he further states as regards atmospheric conditions, that *rigor mortis* commences slowly, but lasts for a longer time in dry, cold air.

Regarding muscular condition, he says that the onset is slower, and the duration longer, in those cases where muscles have been healthy and at rest before death than in those cases where the muscles have been feeble and exhausted, and thus have lost a greater degree of muscular irritability.

It may be mentioned that the deceased is described by the doctor as well built young man. Thus, all the conditions in the present case, including the age, muscular condition and cause of death, as well as the climatic conditions, clearly favoured the late onset and long duration of *rigor mortis*, and in the circumstances it is not impossible that the post-mortem examination may have taken place 60 or 61 hours after the death in spite of the presence of *rigor mortis* in leg.[23]

23.14.18 Development of *Rigor Mortis*[24]

The first contention of learned counsel for the appellants is that Gurdip Singh had actually died at about 3-4 am on 12 June 1990 and his dead body was brought to the house and thereafter, with due deliberations and consultations, the case was planted against the appellants and others by ascribing all of them specific roles, as have been narrated while giving details of events as given by Mohinder Singh, the first informant with a view to prop up the contention, noted above, reliance is placed upon the testimony of P.W. 5 Dr. K.S. Babbar and, in particular, the cross-examination, adverted to him where he stated that it takes 12 hours during which *rigor mortis* develop in all four limbs, and they remain intact for next 12 hours and thereafter they start disappearing and take about 12 hours to disappear completely. He also stated that as *rigor mortis* were found in the four limbs of deceased Gurdip Singh, the death was more than 12 hours before when postmortem was conducted. It may be recalled that as per the prosecution version, the occurrence took place at about 6-6.30 am on 12 June 1990, and post-mortem on the dead body of Gurdip Singh was conducted at 3.30 pm on the same day. Inasmuch as about ten hours had elapsed when the doctor had conducted post-mortem on the dead body of Gurdip Singh, he must have died far before six-sixth.30 a.m. and the time can well be pinned down to 3-3.30 am on 12 June 1990, contends the learned counsel. We have given our thoughtful consideration to the contention of the learned counsel, noted above, and

24. *Mangal Singh v State of Punjab*, 1996 Cr LJ 3258.

find that there is no substance in it. In our view, the opinion expressed by Dr. K.S. Babbar, P.W. 5, with regard to *rigor mortis* is not correct. Modi, in his book titled '*Medical Jurisprudence and Toxicology*' 18th Edn., at p 121 opined as follows with regard to *rigor mortis*:

> *Time of on-set*: This varies greatly in different cases but the average period of its on set may be regarded as three to six hours after death in temperate climates and it may take two to three hours to develop. In India, it usually commences in one to two hours after death and takes one to two hours to develop.....In Northern India, the usual duration of *rigor mortis* is twenty-four to forty-eight hours in winter and eighteen to thirty-six hours in summer. According to the investigations of Mackenzie in Calcutta the average duration is nineteen hours and twelve minutes, the shortest period being three hours and the longest forty hours. .....Cases have occurred in which rigor mortis developed and disappeared within an hour and a half after death.

Taylor, in his book titled *'Principles and Practices of Medical Jurisprudence'*, Vol I, 12th Edition, at p 83, states that "*rigor mortis* usually commence within two to four hours of death, though they may not become evident until five or seven hours have passed". To this general statement, there are numerous exceptions, some of which can be explained by physical facts. The example given by him is as under:

> *In the case of R.V. Aloott (Survey Assizes, 1952) a young man was found stabbed to death in a Railway booking office. When he was first examined, one hour after the crime,* rigor mortis *was absent, two hours later, however, it was complete. The deceased had fought the attackers vigorously before receiving a fatal wound.*

Layon in his book tiled '*Medical Jurisprudence for India',* at p 144, comments as follows:—

> *Niderkorn found it to be fully developed before the end of the seventh hour after death in 92 out of 113 cases (Tidy, Leg Med. IP 62) Taylor (3rd Edn., 1888, I. 513) gives 5 to 6 hours from death for* rigor mortis *to set in 16 to 24 for its continuance or 21 to 30 hours from death on an average. Tidy gives 3 to 6 hours from 36 to 48 hours respectively or 27 to 54 hours from death on average. But in sudden death in a muscular subject from hemorrhage* rigor mortis *may continue for 14 days or long (Gidy Leg. Med. I, 71).*

From the expert opinion of the Authors, mentioned above, we are the view that the opinion given by Dr. K.S. Babbar P.W. 5 that as *rigor mortis* were found in the four limbs, the death was more than 12 hours before post-mortem is incorrect. That apart, the prosecution is supported by four stamped witnesses and if their presence is either not disputed or is proved, the opinion of the doctor would pale into insignificance.[24]

23.14.19 Cause of Death[25] (Compression)

The post-mortem examination was held on the 12 December 1952 at 9 am. On dissection of the body, the civil surgeon found a patch of ecchymosis 3" in diameter on the left side of the chest over the second and third intercostal space along the mammary line. The injury has caused a fracture of the third rib and the chest bone near it (sternum) attached to the third rib. In the opinion of the civil surgeon the injuries on the chest resulting in the fractures were ante-mortem injuries and were caused either by blows with a hard and blunt substance or by applying heavy pressure on the chest.

The doctor explained that the injuries on the chest could be caused by putting the weight of one's body on to the chest of the deceased woman while the latter was laying down, either through the hands or by using one knee, thereby leaving no external marks in injury on the chest. The doctor was definitely of the opinion that the old woman died as a result of shock caused by the injuries on her chest.

The defence of the appellant was that the old woman died a natural death and the appellant was falsely implicated.

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25. *Kutuhal Yadav v State of Bihar*, AIR 1954 SC 720 : 1954 Cr LJ 1802 (SC).

The learned Sessions Judge found first that Musammat Sobha had not died a natural death but had died as a result of the injuries caused on the chest resulting in the fracture of the third rib and the sternum. He further found that the circumstances proved against the appellant were such that the only reasonable inference was that the appellant had caused the injuries on the chest of the old woman on the night of the 10 December 1952 which injuries had caused her death. He held that the circumstances proved against the appellant were incompatible with his innocence, and found the appellant guilty of murdering the old woman and of attempting to cremate her dead body in order to cause the disappearance of the evidence of the offence committed by him.[25]

23.14.20 Cause of Death[26] (blunt weapon, not drowning)

The villagers searched for the body of the deceased but could not find it. Later on, the body was found by the sub-inspector in a canal about half a mile from the place of occurrence. The body had been eaten by tortoises and the head and the face were bitten off and the skin had dropped off. The eye lids were absent. The post-mortem examination was held the next day at about 1 P.M. The visible injuries on the body consisted of a contusion 2 × 3″ on the left shoulder and another contusion 1 × 1″ on the right shoulder. Soft tissues of head and neck were absent. There was fracture of right parietal bone.

In the brain there was clotted blood in an area 4 × 4″ on the right lobe of the cerebrum. The membranes were congested with petechial haemorrhage. In the opinion of the doctor, who performed the post-mortem examination, death was due to coma following the injury on the head. The doctor in his statement in court stated that the head injury could have been caused by one blow or by more than one blow and that death was due to head injury and not to drowning because there was not much bloating and the deceased had not sucked in a large amount of water.[26]

23.14.21 Cause of Death Crowd attack[27]

Mr. Sankunni appeared on the spot and the attack was launched by A. 4. All those who followed his lead and took part in the attack were certainly acting with the intention to do a criminal act. When such a large crowd armed with sticks as those produced in court attack a single man, stones being thrown at him, certainly that assembly must have known the consequences of such act also, especially in view of the specific statement the previous day at the meeting at A.4's house. So none of those who took part in that attack can escape from the consequences of the combined action of the riotous crowd. As to the offence committed against the deceased, the defence contention is that it at the most can only be hurt. It is pointed out that the nature of the injuries mentioned in Ex. O proved and spoken to by P.W. 11 will lead only to that conclusion and that if the death was caused by Mr. Sankunni, it was not due to the injuries sustained in the attack, but only because medical aid was given to him very late in the day. P.W. 11s evidence shows that the injuries noted in Ex. C were serious. In Ex. O itself his opinion is noted down. Here there is the fact that the deceased was left in the spot in a disabled condition and there was premeditation regarding the assault. The assault was by a large crowd armed with sticks and stones. There was previous expression of an intention to murder persons like the deceased. In the face of this the defence cannot escape by saying that if Mr. Sankunni had died of the injuries they cannot be fastened with the liability of the consequences that followed their action. Of course there has been a delay in giving medical aid. It is sad to reflect that a police officer was left in that spot for so many hours within a few miles of a police station and

26. *Behari v State of Uttar Pradesh*, AIR 1953 All 203 : 1952 All LJ 546 : 1953 Cr LJ 565 (All).
27. *Chiramel Varied Devassikutty v State of Travancore-Cochin*, 1953 Cr LJ 1301 : AIR 1953 Trav-Co 275.

a town where medical aid was available and within an hour's run from the central headquarters of the police as well as the division inspector's headquarters and even though accompanying the deceased person and information was conveyed to the highest police authorities within half an hour of the incident. But this fact cannot help the defence.[27]

23.14.22 Cause of Death[28] (Punctured Wound)

Appellant Ishwar Singh was however found guilty under section 302 simpliciter of the Indian Penal Code for the murder. Chauhal Singh died of shock and haemorrhage due to the sharp puncture wound on his chest caused, according to Dr. A.P. Mathur, Additional Civil Surgeon, Meerut, who conducted the post-mortem examination "some sharp edged pointed weapon". He added that the wound "might have been caused with a *ballam*". But whose hand was it that dealt this fatal blow with a "sharp edged pointed weapon". P.W. 1 Mahabir, P.W. 2 Satyapal, P.W. 6. Ram Rikh and P.W. 7 Jait Singh have all repeated that it was Ishwar Singh who struck Chauhal Singh with a *ballam*. But for the reasons we have already given implicit acceptance of their evidence is not possible and one must look for independent corroboration of the fact. The evidence of sub-inspector Karam Chand (P.W. 8) is that a *ballam* was recovered from Ishwar Singh's house, and a *bhala* from Harpal's. Dr. Mathur who said that the fatal injury "might have been" caused by a *ballam*, admitted on cross-examination that he did not know the difference between a *ballam* and a *bhala*. By *ballam* he meant "such weapon as is sharp edged on both sides, pointed, and less than 2 cm. in width" and he added that "if a *bhala* is of this very shape this injury is possible." It is not disputed that *ballam* and *bhala* are weapons of a similar type. Had the doctor seen the weapons seized from the houses of Ishwar Singh and Harpal, it might have been possible for him to say which of them caused the injury. But the weapons seized were not shown to the doctor. In *Kartarey v State of Uttar Pradesh*, AIR 1976 SC 76 (80-81) this court emphasised the importance of eliciting the opinion of the medical witness who had examined the injuries of the victim:

> It is the duty of the prosecution, and no less of the court, to see that the alleged weapon of the offence, if available, is shown to the medical witness and his opinion invited as to whether all or any of the injuries on the victim could be caused with that weapon. Failure to do so may sometime, cause aberration in the course of injustice.

In this case it is impossible to say with certainty whether the injury was caused by the *ballam* or the *bhala* that were seized. Therefore, whether it was Ishwar Singh or Harpal who was responsible for it even if one believed that on the day of the occurrence, former carried a *ballam* and the latter a *bhala*. Ishwar Singh's conviction under section 302 of the Indian Penal Code cannot be sustained in these circumstances.[28]

23.14.23 Accident, Suicide or Murder[29]

Now this medical officer in examination-in-chief said that the injuries could not have been caused by a simple fall from an elevation. On this evidence, the prosecution presses hard for maintaining the conviction of the accused. There would have been some strength in this reliance of the medical evidence if the medical officer had stuck to his statement in examination-in-chief and had not conceded probabilities which completely fitted in with the defence suggestion. In cross-examination he has said that, if the hammer was made to stand on one end, the injuries 1 and 5 could be possible by a fall from a height of 7 or 8 feet. Again, he repeated that those two injuries could be possible by a fall on the hammer if it was kept lying flat. The hammer was sent for and we have seen it ourselves. It is a big and heavy one,

28. *Ishwar Singh v State of Uttar Pradesh*, 1976 Cr LJ 1883 : AIR 1976 SC 2423 : (1976) 4 SCC 355.
29. *Jalwanti Lodhin v State of Bihar*, AIR 1953 Pat 246 : ILR 32 Pat 217 : 1953 Cr LJ 1344 (Pat).

therefore, I am not in a position to say that the statement in cross-examination of the medical officer was made out of some other consideration. Again, the witness has stated that a fall on the cemented floor could cause the fracture of two or three ribs. It is in evidence of one of the prosecution witnesses that the floor was actually a cemented one (*vide* the evidence of P.W. 1). Looking at the injuries, it appears to me that injuries Nos. (1), (5) and (6) which were all on the left side, could be caused by one blow, direct or indirect, and injury No. (4), which was also on the left side, could be the result of injury No. (1). The prosecution has no explanation how the deceased could get an incised wound on the head and a fracture of the second or the third rib if the accused had struck the deceased on the head only with a hammer. There is a difference between incised wounds and incised-looking wounds. In this connection I may state that the sub-inspector found a drum containing lime with bloodstains on it, which were found by the state serologist to be of human origin. This incised injury could not have been caused, to my mind, by a blow of the hammer which has been produced in this case. The prosecution has not been able to give any explanation how the two ribs of the unfortunate woman could be fractured if she was sleeping peacefully on a cot when she was murderously attacked with a hammer. Accordingly, the medical evidence does not fully support the prosecution; rather, the injuries do not at all rule out the possibility of those being caused by a fall from an elevated place.[29]

23.14.24 Reconstruction: Murder or Suicide[30]

The City Inspector Rameshwar Kumar Sharma, P.W., had also arranged to get the dead body in the closet photographed from Gurcharan Singh, Photographer, P.W. 9, and two Photographs, Exhibits p 1 and p 2, along with their negatives, are also on the record. These photographs were admitted by all the four accused. From photographs. Exhibits p 1 and p 2, it is quite evident that the dead body was placed just at the threshold of the door which was the entry of the closet. The dead body appears to have occupied the entire breadth of the store. The head and the back of the dead body were raised against the wall in such a position that the body could not fall. It also appeared that the legs could not be stretched beyond the opposite wall. In this closet were also found various household articles including drums, From a look at the photographs when perused with the statement of the doctor, which has been reproduced above, it becomes crystal clear that the right side of the dead body except the portion just towards the upper right thigh in contact with the mattress on which the dead body was seated had not been burnt. The blouse on the right side except for a few burnt portions was intact. According to the doctor, the blue colour of the blouse had not been affected. The petticoat or the sari cloth on the left leg seems not to have been burnt. All the tell-tale burnt marks were on the left arm, left shoulder, left chest and the left side of the face and head. All the articles lying in the store near the dead body do not seem to be disturbed. At point D in photograph, Exhibit p 1, some article appears to be in close contact with the left side of the dead body, but none of the articles appears to have been disturbed. Plastic bangles on the right arm also do not appear to have been at all burnt. A close look at the second photograph, Exhibit p 2, which was taken by the photographer from the back, shows that the left upper arm and the left shoulder are completely burnt mass and below the elbow nothing is observable. Towards the left of point B and the right of point Y there appears radius which in the opinion of the doctor was jutting out from the elbow joint in a completely burnt condition. There does not appear to be anything below figure Y. The doctor was exhaustively cross-examined at this point by the trial court. In reply to one question, it was stated that the left arm up to the elbow was so much burnt that there was no flesh left and the bones were charred to ashes. In reply to another question, it was clarified that "the burnt bones turned to ashes just like remains left after the cremation." It was

30. *Kuldip Sham v State of Punjab*, 1980 Cr LJ 71.

also deposed that only the upper two-thirds portion of the radius and ulna were jutting from the elbow joint and the rest had fallen off. In reply to another question, it was stated that the rest of the portion was missing. However, after the statement had been completed, the doctor, before signing the statement, without the order of the court and without bringing the same to the notice of the court, himself added the word "not" thereby showing "the rest of the portion was not missing."

A close perusal of the statement of Dr. G.D. Chawla, P.W., leaves strong impact on the mind that it was his clear statement in the first instance that the portion below the elbow joint of the left arm was missing and had been completely burnt to ashes. Subsequently, however, he made a deliberate attempt to wriggle out of it and to make equivocal statement that some bones were jutting out of the elbow joint.

According to the trial court, the burns on the dead body of Usha Rani, deceased, were not ante-mortem and that one-third portion of the left arm below the elbow was missing before the dead body was put to fire and the same was done in order to conceal the injuries which may have been inflicted on that part before her death. It was also opined that the doctor had not dissected the head and the face from which also correct opinion could be formed if some injuries had been inflicted on the said parts of the body. The doctor, however, categorically stated that the burns on the dead body of Usha Rani were ante-mortem in nature and were sufficient to cause her death in the ordinary course of nature. Though it is not possible to form a categorical opinion from the material on the record if the burns on the dead body were ante-mortem or post-mortem in view of the categorical statement of the doctor, yet from the oral evidence of the witnesses who had seen the dead body lying in the closet, as referred to above, the two photographs and the statement of the doctor, no doubt, is left that even if it was a case of death by fire and the consequential burns the body of Usha Rani had not been subjected to fire in the closet and that the dead body was placed therein only after death. If Usha Rani had caught fire whether accidentally or intentionally to commit suicide, after the body caught fire, she must have writhed with pain and made frantic movements of hands and legs and the natural consequence would be that the articles lying near the dead body must have been disturbed. Besides the wall, the door and the threshold where the body was seated or was in contact must have also borne the impact of fire and the smoke. At least, the rice lying in the *thali* could not but show signs of the impact of intensive fire. It is clear from the photograph, Exhibit p 1 that a cloth is covering the dead body which did not have any sign of fire or even smoke. Indisputably, this cloth had been put on her after she had died. Even according to Mohan Lal, CW, who had just followed Ram Lal, accused, after Shanti Devi, accused, had raised hue and cry, he did not see any person had seen the closet. Thus, the only conclusion possible is that Usha Rani was already dead whether by fire or otherwise when her dead body was placed in the closet.

After having arrived at the above conclusions, the conduct of Kuldip Sham, accused, assumes considerable importance as in a case based only on circumstantial evidence, the conduct of the accused is also an important link in the chain of incriminating circumstances to arrive at the correct conclusion. According to the statement of Kuldip Sham, accused, after the close of the prosecution evidence, he used to go for a morning walk every day and on 28 March 1976, had gone for a walk at 6.15 am along with his partner and friend, Dharam Vir Mahajan, CW 1. At that time, his wife Usha Rani was quite fit and alive. When he returned at about 6.45 am he found a crowd of people having collected in front of his house. It was then that he came to know that Usha Rani was dead and her dead body was lying in the closet, he further stated that Usha Rani had died by sprinkling kerosene oil on her body and then putting herself on fire after he had left the house for a walk in the morning. This defence version stands completely negatived and contradicted by the convincing evidence and the objective circumstances on the record. As discussed above in the closet, but her dead body had tragic end. Even Mohan Lal CW, who

had immediately followed Ram Lal, accused on hearing the cries, did not see any sign of fire or smoke coming out of the closet at any time in the morning. The version of the accused that he had gone for a morning walk with Dharam Vir Mahajan, CW, was also belied by the deposition of the latter as a court witness (CW 1). According to his deposition, he did not even know Kuldip Sham, accused, and had not gone with him for a morning walk. This conduct of the accused in fabricating a story that he had gone out of the house in the morning and that it was in his absence within a short span of half an hour or so that his wife Usha Rani committed suicide is a strong indication of his guilty mind and a deliberate attempt on his part in order to conceal the commission of offence. If it were Kuldip Sham, accused, and Usha Rani who had slept in the house on the relevant night, and Usha Rani had for one reason or the other, committed suicide or had died by accident, it was not probable that Kuldip Sham, accused, would concoct such a cock and bull story. The relations between the two being strained and Kuldip Sham being aggrieved against his wife whether on account of the non-fulfilment of his demand for more dowry or because he suspected her fidelity on account of the seizure of the letter addressed to her by some other person, the dead body of Usha Rani found in the closet in suspicious and mysterious manner and the deliberate attempt on the part of the accused to concoct a false story are such incriminating circumstances from which no other conclusion is possible except that it was Kuldip Sham, accused, who was instrumental in committing the murder of his wife by putting her on fire or in any other manner. It has been held in *Deonandan Mishra v State of Bihar*, AIR 1955 SC 801 : 1955 Cr LJ 1647 : (1955) 2 SCR 570, that in case of a murder when there is no direct evidence and the prosecution case is based only on circumstantial evidence, absence of explanation or false explanation by the accused serves as an additional link in the chain of circumstances to connect the accused with the offence. In the present case, as discussed above, the accused, Kuldip Sham, came out with a statement in explanation regarding the cause of death of his wife which has been found to be palpably false.[30]

23.14.25 Number of Assailants[31]

The deceased was a healthy person and 30 years of age and according to the post-mortem report had received 22 injuries in various parts of the body with a sharp edged weapon, while two injuries had been caused with a blunt weapon. In the opinion of the doctor these two injuries could also be caused by a fall on a hard substance.

If the statements of the eye-witnesses had been correct, and if it were true that all the three were giving the beating then there would have been a sufficient number of injuries caused by *lathis* as well. The medical evidence discloses that the two accused who practically played no part, while Phoola who was armed with a sharp-edged weapon, was busy inflicting the injuries all the time. Where an interested witness makes a verbal statement as regards the existence of certain facts, and it is possible for the court to put it to a test in the light of checks available on the record, it should not be easily accepted unless it is corroborated and stands the test. The important check available in this case consists of the post-mortem report and since it shows almost all the injuries inflicted with sharp-edged weapons, the statements of the witnesses, that all the accused were inflicting injuries when they saw them, cannot be accepted as true and must be rejected as false.

23.14.26 Oral v Medical Evidence: Resolution[32]

If the medical evidence is believed, it is clear that seven persons could not have participated in this crime. Where there is a conflict between the medical evidence and the oral testimony

31. *Abdul Salam v State of Jammu and Kashmir,* 1953 Cr LJ 1865 : 10 J&K LR 94.
32. *Thakur v State of Uttar Pradesh*, AIR 1955 All 189 : 1955 Cr LJ 473 (All).

of witnesses, the evidence can be assessed only in two ways. A court can either believe the prosecution witnesses unreservedly and explain away the conflict by holding that the witnesses have merely exaggerated the incident or rely upon the medical evidence and approach the oral testimony with caution testing it in the light of the medical evidence. The first method can be applied only in those cases where the oral evidence is above reproach and creates confidence and there is no appreciable reason for the false implication of any accused. Where the evidence is not of that character and the medical evidence is not open to any doubt or suspicion, the only safe and judicial method of assessing evidence is the second method.[32]

23.14.27 Skeletal Remains[33]

1. It is obvious that, in order to bring home guilt to the accused, the prosecution must affirmatively establish that the human remains exhumed in this case were those of the deceased Sellayee. If that fails, it would obviously be most unsafe to act upon the retracted judicial confession, even if we believe that the confession might have been voluntarily made, and that it does contain elements of truth. For it is a fundamental maxim of the criminal jurisprudence administered in this country, that suspicion and conjecture cannot take the place of legal proof.

If there is any possibility, even apart from a probability, that Sellayee might turn up alive from the Nilgiris tomorrow, or some future date, the accused cannot be convicted of this murder. That possibility can be excluded only upon adequate evidence of the *corpus delicti*. In the present case that inference is sought to be established upon the report of the chemical examiner (Exhibit p 16A), containing the opinion of an expert and the identification of the piece of saree (MO 1) and the torn jacket (MO 2) and perhaps also upon the discoveries made in pursuance of information given by this appellant from the river bed, the wig or false hair (MO 7) and the bead necklace (MO 3).

Now we desire to emphasise that, whatever might be the situation in law with regard to proof of a report of a chemical examiner or other expert such as (Exhibit p 16A), where that report not merely contains the result of a laboratory test, like the presence of human bloodstains, but also contains the opinion of an expert upon inspected material, such as bones or part of a skeleton, it is certainly the duty of the prosecution to examine the expert, and not merely to rely upon the report. The public prosecutor at the trial should certainly have examined. Dr. Asiryadham, the expert, instead of merely contenting himself with marking the report. We have now rectified this lacuna by ourselves examining Dr. M. Asirvadham, B.A., M.B.B.S., Ph.D., F.C.A.P., Professor of Forensic Medicine, Madras Medical College, whose opinion was the basis of the report.

His explanation is sufficient to show that it would be most unsafe to base the identification of the remains exhumed in this case upon his expert testimony. Dr. Asirvadham is clear that the bones were most probably of those of a female aged between 16 and 20 years, from the bones of the pelvic girdle examined by him, as well as the epiphyses of the shoulder bones. But he is not even clear that all the bones must necessarily relate to a single individual. Referring to the cuts noticed in the bones (items 3 and 4) he is not at all certain that they must necessarily have been caused ante-mortem.

The account of the murder in the judicial confession, Exhibit p 5, was read out to him, and he is not at all certain that the account inevitably fits in with the data revealed by his expert scrutiny of the bones. Apart from this, it is obvious that no reliance can be placed upon the piece of cloth or jacket (MOs 1 and 2). For P.W. 1 himself told the police that, in the absence of any specific marks, he could say nothing about the identification. There is another

33. *Marudai Prisoner (re),* AIR 1960 Mad 370 : 1960 Cr LJ 1102 (Mad).

important point. Several bones were missing including the entire skull. The account in Exhibit p 5 is that the head was severed, and separately buried a short distance away, in the same river bed.

Why were the skull bones never recovered by the police? As regards the bead necklace (MO 3) and the wig (MO 7) they are articles which could have belonged to any poor woman of the lower classes and admit of no identification whatever. Dr. Asirvadham concedes that the cuts found in the bones could have been caused post-mortem during burial or exhumation by the sharp edge of a spade, In brief, it is impossible to conclude that the bones exhumed were those of Sellayee, or that the *corpus delicti* has been established.

23.14.28 Dry Bone after 4 days of murder unlikely[34]

The first point for consideration before the jury was whether Kalaram was actually dead and whether his death has been conclusively proved by the evidence on record. Next comes the question of the culpability of the accused. The learned judge tentatively suggests that the bones might not have been those of Kalaram because there were no identifying marks but he does not say what is to be inferred if the bones are wrong bones. Neither does he say that this is an essential point on which the jury should come to a decision.

The learned judge says that he read out the medical evidence to the jury but surely he did not ask them to apply their minds as to whether the bones of a man murdered only four days ago could have been found in the condition in which they were found by the doctor who held the post-mortem examination rather a scrutiny over the bones. Nobody speaks about any foul smell nor of any decomposed human matter lying about near those scattered bones which were seized by the police from inside a jungle. The bones were dry and clean they bore no marks of flesh. Most of the bones were dismembered from the trunk and the greater part of the human body was missing including a skull. In other words, there were some disjointed pieces of human bones dry and devoid of flesh. The glaze in the bones had disappeared and the ends were all rough. There was no sign of ante-mortem injury on the bone.

The members of the jury undoubtedly had a right to think about this and they could have judged for themselves whether the bones of a man murdered on the 16th could have been in this condition on the 20th or 21st of April on which date the post-mortem examination was held. The witness going to the locality from where these bones were collected did not say that there was any foul smell in the locality or there were fermented blood or decomposed human materials near about the place. The evidence of the investigating officer is that the place from which this dead body and the clothes were seized were at a distance of 15 feet from the road and the prosecution evidence is that men used to pass that way from Malaibari to Khetri and nobody complained that there was any foul smell during those days even earlier to the bones being seized. In case the jury had come to the finding that these bones were bones of some other person lying dead, they might have equally suspected the identity of the clothes which were lying there about as said by P.W. Govinda. It is well-known that if a material part of the prosecution story is found to be false or fabricated, the jury would be entitled to doubt the genuineness of the rest of the story or doubt the prosecution case itself. This was obviously such a factor to which the judge ought to have directed the attention of the jury and this omission is a material misdirection which in my opinion vitiated the charge.

34. *Tirtha Bahadur Bhojal v State of Assam*, 1955 Cr LJ 782 : AIR 1955 Assam 107.

23.14.29 Recovery of bones does not identify the victim[35]

It was contended by Mr. Rajabalan that mere recovery of 22 human bones from a pit in a town like Davangere will not lead to an inference that those bones are the bones of Motimala. The fact that M.Os. 11 and 12 were found in the pit, which was full of water and which was exposed cannot be disputed in view of the evidence of P.W. 32, the C.P.I., the panch witness P.W. 21, N.B. Basanur, and P.W. 28 the wife of the deceased. It was contended by Mr. Rajabalan that human body consists of more than 200 bones and on this basis he contended that the recovery of only 2 bones would not lead to an inference that the bones recovered were those of Motimala. Taking into consideration the state of affairs and the condition of the pit in which the clothes and the bones were found, (the possibility of some bones having been dragged away by dogs or vultures cannot be ruled out). The 22 bones recovered were undoubtedly human bones and that is the evidence of P.W. 31, Dr. Ramu, associate professor of Forensic Medicine. Then what should have happened to the remaining bones? The only irresistible conclusion is that the other bones must have been dragged away by dogs, vultures, There is indisputable evidence which establishes that the 22 bones that were found in the pit must be some of the bones of the dead body of Motimala. The two clothes namely M.Os. 11 and 12 have been identified as belonging to Motimala. A-l has not given any rational explanation how and under what circumstances he had the knowledge that the clothes belonging to Motimala and the bones were in the pit. With regard to the seizure of M.Os. 11 and 12 and the bones M.O. 9 there cannot be any dispute because the property form under which these articles were seized shows that they were produced before the magistrate on following day, and orders were obtained for retention.

Corpus delicti means first that a crime has been committed, that is to say that man is dead and that his death has been caused by a crime. But it is understood that the dead body itself is not *corpus delicti*. If the crime has been committed and if the dead body is not found or traced, the person who committed the crime cannot be permitted to contend that because the dead body is not available, he is not liable to be punished. What is necessary in cases of this nature is that it must be positively established that the man was murdered, and whether or not the dead body is available, if the other evidence supports the commission of the crime, the accused could be convicted. One does not begin to enquire whether the accused is guilty of a crime until one has established that a crime has been committed. Regard must be had not only to what is intended to be done but how it is attempted. If the crime is established, whether or not the dead body is found, the accused could be convicted. The circumstances mentioned above conclusively establish that Motimala was alive on 17 June 1969, who in the ordinary course, would have returned to Bombay but in fact did not return as expected, but on the other hand, what is established in this case is that two of his clothes identified by P.W. 28 were found in the pit along with 22 human bones. This fact conclusively establishes that Motimala must have been a victim of a foul play on or about 17 June 1969.

In support of the above fact, there are a number of other circumstances to probabilise the case of the prosecution. The same day on which information was given A-l, the remaining clothes of Motimala were recovered from the hut of A-l at Davangere. If Motimala, as contended by Mr. Rajabalan, was alive, he would not in the ordinary course have left his clothes in the house of A-l and gone away. All the clothes that were brought by Motimala from Bombay to Davangere were either found along with the human bones or in the hut of A-l. The facts stated above, therefore, clearly point out to the only conclusion that Motimala was done to death on or about 17 June 1969.

35. Re *Surchand Ramji Chavan*, (1972) 1 Mys LJ 297 : 1972 Mad LJ (Cri) 196 : 1972 Cr LJ 1108 (Mys).

23.14.30 Unidentified Skeleton No evidence[36]

The skeleton was sent to the Central Forensic Science Laboratory for examination and report and Ex. P.W. 18/A is the report in regard to the said skeleton. The report states that the skeleton was of a human being and the skull had four prominent injuries. The report also says that injuries marked A and B on the skull could have been caused with the *dranti* but no opinion could be given in regard to the other injuries.

The identity of the human skeleton is sought to be proved by the evidence (a) that two front teeth in the upper jaw and two front teeth in the lower jaw were missing and (b) that the clothes found on the skeleton were of the deceased Jai Ram. In the report Ex. P.W. 14/A Shanti had given the following description of Jai Ram, age 58/59 years, wheatish colour, stout and healthy body, height about 6 ft., broad forehead, broad face, one front tooth of upper jaw missing, grey hair on the head, wearing a *khaddar kurta* of almond colour and a *dhoti*, and an ordinary *jutti* (shoes) in his feet.

The Director, Central Forensic Science Laboratory in his report only found that the skeleton was of a human being. No medical opinion was obtained as regards the age, sex or estimated height of the human being whose skeleton it was. There is also no evidence that the bones belonged to one individual. A medical expert on an examination of the bones could have given opinion as to the age, sex and estimated height of the person to prove that the skeleton was of the deceased Jai Ram, but no effort was made to obtain such an opinion. P.W. 3 Sher Singh, brother of the deceased, gave evidence that he identified the skeleton as that of his brother Jai Ram from the missing teeth and the shirt and the dhoti. P.W. Tara Chand made a similar statement. P.W. 7, Jai Narain gave evidence that he used to stitch the clothes of Jai Ram and he can identify the *kurta* p 2 which was stitched by him for Jai Ram. In cross-examination he stated that he was not asked by the sub-inspector to identify the *kurta* but he had done so on his own, that he had not put any mark of his own on the *kurta* when he stitched it. P.W. 8, Ram Kumar stated that he identified the skeleton as of Jai Ram by the broken teeth in the upper and lower jaws.

We saw the clothes in the court and in our view the clothes, in the state they are, were not capable of identification. Clothes like p 2 are a common wear and it would be wholly unsafe to fix the identity of the skeleton on such evidence. The wife of Jai Ram was missing. The identification by P.Ws. 1, 3 and 8 of the skeleton from the broken teeth in the upper and lower jaws are also not convincing on the facts of this case, in our view, it cannot be said beyond doubt that the human skeleton recovered was of Jai Ram.

The skeleton was recovered from an open place which was accessible to all even if it be believed that the skeleton was recovered on the information given by Joginder Singh accused, the possibility that he may have come to know from some other source of a dead body having been buried at that spot cannot be ruled out. In any case, no conviction under sections 302 and 364 could be founded on the solitary piece of evidence that a human skeleton was recovered at the instance of Joginder Singh, even if the skeleton is held to be that of Jai Ram. At best the offence against Joginder Singh would be one under section 201 of the Penal Code and the sentence awarded to him under section 201 was one year which he had already undergone.[36]

23.14.31 Age by Radiography[37]

1. But there is a greater infirmity which strikes at the root of the order. It is alleged in the petition that detenue was a minor aged about 17 years at the time of arrest and detention and

36. *Joginder Singh v State of Delhi*, 1975 Cri L J 233 (HC).
37. Jaya mala v Home Secretary J&K, AIR 1988 2 SC 1297.

that it is difficult to even conceive that this school going minor boy would indulge into such activities as to be a serious threat to the maintenance of public order. In para 7 of the petition it is alleged that the detenue was not even 17 years of age at the time of his detention. In the return filed on behalf of the State, the only assertion is that this averment is misconceived and needs no reply. But in para 2 of the return under the heading paragraph-wise reply it was denied that the detenue was a minor and it was further averted that his age was between 18 and 19 years. In support of this averment reliance was placed upon report as to the age issued by Dr. T.R. Sharma attached to Government Medical College, Jammu, Dr. Sharma appears to have examined the detenue for ascertaining his age by radiological and orthopaedic test on 3 May 1982. The relevant portion of the report reads as under:

> *Epiphysis around ankle, wrist, elbow and shoulder joints have appeared and completely fused. Epiphysis for iliac crest has appeared and partially fused. Radiological age is between eighteen and nineteen years.*

Detenue was arrested and detained on 18 October 1981. The report by the expert is dated 3 May 1982, that is nearly seven months after the date of detention. Growing in age day by day is an involuntary process and the anatomical changes in the structure of the body continuously occur. Even on normal calculation, if seven months are deducted from the approximate age opined by the expert, in October, 1981 detenue was around 17 years of age, consequently the statement made in the petition turns out to be wholly true. However, it is notorious and one can take judicial notice that the margin of error in age ascertained by radiological examination is two years on either side. Undoubtedly, therefore, the detenue was a young school going boy. It equally appears that there was some upheaval in the educational institutions. This young school going boy may be enthusiastic about the students' rights and on two different dates he marginally crossed the bounds of law. It passes comprehension to believe that he can be visited with drastic measure of preventive detention. One cannot treat young people, may be immature, may be even slightly misdirected, may be a little more enthusiastic, with a sledge hammer. In our opinion, in the facts and circumstances of this case the detention order was wholly unwarranted and deserved to be quashed.[37]

23.14.32 DOB Records or Radiography[38]

The learned trial Judge has taken into consideration the discrepancy found in the date of her birth as recorded in her school record as transpiring from her school leaving certificate at Ex. 7. Therein her birth-date is recorded as 15 August 1968. When the more reliable proof of her birth-date is available in the form of an extract from the birth register, it is not necessary to rely on the birth-date recorded in her school register, more particularly when the difference is hardly of 34 or 35 days. It is possible that at the relevant time the age of a child to be admitted to school was relatable to the cut-off date of 31st August, If her birth-dates as found in the extract of the birth register at Ex. 8 was taken into consideration, she could not have been admitted to school on account of the cut-off date of 31st August. If her birth-date as found in the extract of the birth register at Ex. 8 was taken into consideration, she could not have been admitted to school on account of the cut-off date of 31st August of the concerned year. It is not uncommon that the birth-date of a child is advanced to a certain extent with a view to saving one precious academic year. It is possible that, in order to admit the child to school to save her precious one year, the birth-date of the child was required to be advanced in such a manner as to fall within the cut-off date of 31st August. That appears to be the reason why in the school record her birth-date was shown to be 15 August 1968 and not 19 September 1968 as found in the extract of the birth register at Ex. 8.

38. *Gujarat v Inayathusen Mahmadmiya*, 1996 Cr LJ 3225.

We know that conjectures, hypotheses and/or surmises have no play in the criminal trial as such. We also know that no explanation has been brought on record by or on behalf of the prosecution with respect to the discrepancy of the birth-date recorded in the extract from the birth register at Ex. 8 and the school leaving certificate at Ex. 7. Since the difference found is of 35 days only, we have permitted ourselves to travel in the realm of conjectures, hypotheses and surmises. This is based on human behaviour and conduct as is commonly known. With respect, the learned trial Judge has made no attempt to explain away such discrepancy. Besides, as indicated by us hereinabove, the birth-date recorded in the birth register maintained by a local authority like the Municipal Corporation of Ahmedabad would furnish a more reliable proof of the age of the child mentioned therein rather than the birth-date recorded in her school register. We are of the opinion that the extract of the birth register at Ex. 8 would prevail over the school leaving certificate at Ex. 7 so far as the birth-date of the girl in this case is concerned. In this view of the matter, we have to accept the birth-date as recorded in the document at Ex. 8 and it is 19 September 1968. She was therefore aged 14 years 10 months and 23 days on the date of the incident.

We are supported in our view by the Division Bench ruling of the Kerala High Court in the case of *Krishnaranjan v Doraswamy Chettiar*, AIR 1966 Ker 305. It has been held therein that entries in the birth register furnish the best evidence of the date of birth and can safely be accepted unless they are shown to be wrong. It has further been observed therein that birth entries in the registers of public schools, though relevant under section 35 of the Evidence Act, 1872, are of far less evidentiary value and of little avail to show the correct age of the person concerned. We are in respectful agreement with the aforesaid principle of law enunciated by the Division Bench of the Kerala High Court in its aforesaid ruling in the case of *Krishnaranjan* (supra). The aforesaid Division Bench ruling of the Kerala High Court cannot and need not be distinguished on the ground that it was rendered in a civil case and not in a criminal case. What has to be culled out from its reading is the principle of law it has enunciated.

23.14.33 Medical Evidence[39]

Ordinarily, the value of medical evidence is only corroborative. It proves that the injuries could have been caused in the manner alleged and nothing more. The use which the defence can make of the medical evidence is to prove that the injuries could not possibly have been caused in the manner alleged and thereby discredit the eye witnesses. Unless, however, the medical evidence in its turn goes so far that it completely rules out all possibilities whatsoever of injuries taking place in the manner alleged by eye-witnesses, the testimony of the eye-witnesses cannot be thrown out on the ground of alleged inconsistency between it and the medical evidence.

The main ground on which the evidence of the eye-witnesses have been discarded by the Sessions Judge, as observed belied the prosecution case. The High Court, in our opinion was fully justified in coming to the conclusion that medical evidence did not belie the prosecution case, rather it was in support of the prosecution case. In the view that the High Court took about the medical evidence, it proceeded to consider the worth of the evidence of the eye-witnesses. In the opinion of the High Court all the three witnesses were possible witnesses and their presence was quite natural. P.W. 4, being the widow of the deceased was likely to be present at home and see the incident herself. P.W. 3 was also the grand-daughter of the deceased. Her presence at house is also a likely one. The third witness was a neighbour. The evidence of P.W. 4 was sought to be challenged on the ground that in her deposition before the police she had not named P.W. 3, the grand-daughter of the deceased as present at the time of the occurrence and the evidence of P.W. 3, the grand-daughter who was aged seven years or eight years, was

39. *Solanki Chimanbhai Ukabhai v State of Gujarat,* AIR 1983 SC 484 : (1983) 2 SCC 174 : 1983 Cr LJ 822.

sought to be discarded on the ground that her name was not given by P.W. 4 in her statement before the police. The High Court has dealt with both these criticisms and has rightly come to the conclusion that all the three witnesses were natural witnesses and were present at the place of occurrence. The High Court has discussed the evidence of these three witnesses at great length and has also considered the grounds on which the testimony of these witnesses has been discarded by the Sessions Judge. It has given cogent reasons for relying on the testimony of the three witnesses. No exception, in our opinion, can be taken to the appraisal of the evidence made by the High Court.

23.14.34 Circumstantial evidence[40]

The deceased, a minor girl aged about 8 years, had gone to attend the 'Mela' along with her younger brother. It is the case of the prosecution that the appellant who is aged about 50 years then, took away the deceased from the 'Mela' and committed raped and murdered her. The father informed the police stating that his daughter, who had gone to attend the 'Mela', has not returned home. Upon such complaint, the case was registered and investigation commenced. It was the case of the prosecution that in the process of investigation, Investigating Officer found a headless body of the deceased in the bushes. During the process of investigation, the statement of the appellant was recorded and the blood stained clothes and articles he used for the offence were recovered from his house.

It is contended by learned counsel for the appellant that though there is no acceptable and convincing evidence to prove the guilt of the accused beyond a reasonable doubt, the appellant is convicted by the trial court based on the circumstantial evidence which is not enough to record guilt of the accused. It is submitted that from the evidence on record, the prosecution has also failed to prove the concept of 'last seen'.

The Court has observed that the brother of the deceased who has accompanied the deceased to 'Mela' on the fateful day. He has identified the accused in the Test Identification Parade and further he has categorically stated that the appellant took away the deceased from the 'Mela'. Further, PW-1 has deposed that when he was coming from his shop to the residence, he saw a dog running away with a leg of a child in its mouth and on being chased it dropped the leg. Further investigation revealed detection of headless body of the deceased in the bushes. Further, PW-7 has also stated that he had seen the appellant on the fateful day at 9.00 pm with a girl wearing a yellow frock. By applying the 'last seen' theory to the facts of the case and further considering the forensic and medical evidence on record, trial court has rightly recorded guilt of the accused for the offences alleged and the High Court, referring to the relevant evidence on record, has rightly confirmed the conviction of the appellant for the charges levelled against him.

23.14.35 Judges as Medical Expert[41]

The High Court has opined that the extensive injury No. 2 found on the deceased could not have been caused with a weapon like a *pharsa*, but with a weapon having a long curved blade. Here also, the learned judges were not on *terra firma*. *Pharsa* is a sharp-edged weapon. We are told its blade resembles a *gandasa* blade or may even be curved like that of a battle-axe. The *pharsa* or the weapon with which the fatal injuries were caused has not been recovered. This argument therefore, rests on imaginary premises. The best person to give an opinion about

40. *Nand Kishore v State of Madhya Pradesh,* AIR 2019 SC 3310.
41. *Raisul v State of Uttar Pradesh*, AIR 1977 SC 1822 : (1976) 4 SCC 301 : 1977 Cr LJ 1555 (SC). **Also see**: *Arshad v State of Andhra Pradesh*, 1996 Cr LJ 2893 : 1996 (3) Andh LD 410; *Ambika Prasad v State (Delhi Admn.)*, AIR 2000 SC 718 : (2000) 2 SCC 646 : 2000 Cr LJ 810.

the nature and shape of the weapon of offence used, was the medical officer (P.W. 4) who had conducted the autopsy. The doctor (P.W. 4), as already noticed, testified that the injuries found on Panchania (deceased) could have been caused with a *pharsa* or some other sharp edged weapon.

Dr. Bhuneshwar Prasad (P.W. 3) also, who had examined the child, Jai Devi testified that the injuries found on the child had been caused with "some sharp-edged weapon including a *pharsa*". The High Court was thus clearly in error in substituting its own opinion resting on conjectural premises for that of the medical experts regarding the nature of the inflicting weapon.[42]

It is true that the learned Sessions Judge on looking at the appellant thought that he must not be less than 24 years of age, and the High Court also, on seeing the appellant personally, took the view that the estimate of age given by the Sessions Judge was correct, but we do not think that the learned Sessions Judge as well as the High Court were right in substituting their own estimate in regard to the age of the appellant and on the basis of such estimate, rejecting the statement as to his age made by the appellant. Appearances can often be deceptive. We must, therefore, proceed on the basis that the appellant was below 18 years of age when he committed the offence.

23.14.36 Improper Appreciation of Medical Evidence[43]

The most important question that requires consideration in this appeal is whether the accused appellant did not suffer any injuries in the hands of the assailants who had committed the murder of the deceased Shashivandanaben but such injuries had been suffered by the accused appellant either on account of self-inflicted injuries or on account of injuries caused by a friendly hand. For basing the conviction, the learned third Judge and the Sessions Judge have held that the appellant did not suffer injuries on her head or on the eye by the assailants who had committed the murder of the deceased. But such injuries were either by way of self-inflicted injury or by a friendly hand in an attempt to give an appearance that the appellant was also attacked by the assailants who had committed the murder of the deceased. It is not in dispute that the acused was removed to Vadilal Hospital along with the deceased and the accused was admitted as an indoor patient in the said hospital. The accused was examined by the doctor in the hospital, namely, Dr. Virendra S. Manek (P.W. 3) at about 12.25 midnight on 25 October 1979 in the Emergency Ward of the hospital and the following injuries were noted on the person of the accused:—

1. C.L.W. ½″ × ½″ × ¼″ curved shape on the left parietal occipital region.
2. C.L.W. 1″ × ½″ × ¼″ on the left parietal region posterior to above injury.
3. C.L.W. 1″ × ½″ × ¼″ curved shape on the left parietal occipital region.
4. C.L.W. 1″ × ½″ × ¼″ on the right parietal region posteriorly.
5. C.L.W. 1″ × ½″ × ½″ over occipital region irregular in shape. Bone deep.
6. C.L.W. 1″ × ½″ × ½″ over occipital region anterior to above injury No. 5.
7. C.L.W. ½″ ½″ ¼″ over right parietal region anterior part.
8. There was sub conjunctival haemorrhage on the left eye.

42. *State of Uttar Pradesh v Shanker*, AIR 1981 SC 897 : 1980 Supp SCC 489 : 1981 Cr LJ 23 (SC).
43. *Tanviben Pankaj Kumar Divetia v State of Gujarat*, AIR 1997 SC 2193 : 1997 AIR SCW 2055 : 1997 Cr LJ 2535.

Dr. Manek has indicated that all the said injuries were possible by a blunt object. There was no fracture of the scalp bone. The doctor also noted that there was also bleeding at the occipital region when he had first seen the injury. The accused was kept as an indoor patient in the same hospital and was discharged from the hospital on 31 October 1979. It may be stated here that the infant child of the accused aged about six months was also examined in the hospital and the following injuries were noted on the person of the infant:

1. One abrasion ½″ × ¼″ over the right side of forehead.
2. There was diffused round swelling size ½″ × 1″ over the forehead.
3. There was soft tissue swelling on frontal region which was found on X-ray.

The doctor has stated that the abrasion found on the forehead of the infant child was possible by contact with a blunt object and the same could also be caused by a fall. So far as the swelling injury of the child was concerned, the doctor has stated that such swelling might be the manifestation of the internal injury.

Dr. Manek has categorically stated that the injuries sustained by the accused could not be self-inflicted. In this connection, Dr. Manek has stated that there are five layers over the head of the skull and if the injury is bone deep, it can be said that the five layers have been penetrated. The doctor has further stated that he apprehended that the said injury on the eye was likely to be on account of injury on the anterior cranial fossa which was part of the base of the skull. No fracture of the skull, however, was found after X-ray was taken. Dr. Manek has also stated that skull wounds normally bleed very freely. For the purpose of giving treatment to the accused, her hairs were shaven and at that time, bleeding of about 20 or 25 cc of blood had taken place. It has also come out in the evidence of P.W. 4 Dr. Dilip Hargovandas Shah that the accused was brought in the emergency ward and thereafter Dr. Desai had given stitches on the wounds of the head of the accused.

In this case, the expert opinion of Dr. Shariff as to the nature of the injuries suffered by the accused was sought for by the prosecution. Opinion as to the probable time of death of the deceased after receiving injuries was also sought. The said Dr. Shariff was requested by letter (Ex. 24) by the Superintendent of Police Force (Crime Branch) to give his expert opinion the following points:

1. Please scrutinise the P.M. Notes and state as to at about what time the deceased might have died.
2. Whether the deceased would have died on the spot looking to 21 injuries on her person as mentioned in P.W. Note.
3. What is your expert interpretation about the term "Defence incised wound."
4. Kindly refer to the medical certificate of Smt. Tanviben P. Divetia.
5. State whether these injuries could be self-inflicted.
6. Looking to the injuries on the person of Tanviben whether it was necessary to admit her as an indoor patient.
7. Whether the injuries found on the head of Smt. Tanvi Divetia could be inflicted by giving blows with the hammer.

Dr. Shariff by his letter dated 17 March 1980, gave his opinion on the said queries after going through the injury report of the accused and the post-mortem report of the deceased and also in-patient record of accused Smt. Tanviben and out-patient record of the accused. Although Dr. Shariff has given his opinion that the injuries suffered by the accused were simple in nature, he has admitted that since the injuries were found on the head of the accused, the

hospitalisation of the patient was desirable for observation and treatment. Dr. Shariff has also opined that the injuries on the head of the accused were not consistent with the injuries usually caused by hammer but he has also stated when cross-examined by the learned counsel for the accused, that he had not seen any hammer before giving any opinion and without seeing the hammer, definite opinion could not be given. He has also stated that by the expression 'hammer,' he meant hammer of considerable size and he admitted that he did not understand the difference between '*hathodi*' and '*hathoda*'. He has also stated that it was dangerous for a person to cause injury by himself or herself on the head and agreed that in respect of some injuries of the accused little more force might have resulted in fracture of skull. Dr. Shariff has also stated that Modi's *Medical Jurisprudences* is one of the standard books but he disagreed with the view expressed by Dr. Modi in Modi's *Medical Jurisprudence and Toxicology* that contusion and lacerations on the head could rarely be self-inflicted. But Dr. Shariff has agreed with the view that contused or lacerated wounds could rarely be caused on account of the pain they are likely to cause and the force required to produce them as indicated in the Textbook of *Medical Jurisprudence and Toxicology* by Dr. C.K. Parikh. Dr. Shariff has also stated that superficial injury means the injury situated on or near the surface. When his attention was drawn that injury No. 5 suffered by the accused is extended up to bone and whether such injury can be stated to be superficial injury. Dr. Shariff has stated that such injury has not been stated to be superficial by any authority and he may have to find out some authority in support of his view that such injury is superficial and he has also added that the opinion was given by him on the basis of his own experience. He has also admitted that he has not seen the report of the radiologist and also the X-ray plate of the accused.

So far as the sub-conjectival haemorrhage on the eye of the accused is concerned, Dr. Shariff has stated that sub-conjectival haemorrhage was likely to be the result of direct blow in or around the eye and he has agreed that normally a person could not cause an injury on the eye by oneself and he has also not come across any case of self-inflicted injury on the eye. He has also agreed that the injury on the eye was not on account of self-inflicted injury. He has also admitted that from the case papers of the accused there was nothing to suggest that haemorrhage was an old one. Dr. Shariff has also stated that severe blow by hard and blunt substance had resulted in such injury. Dr. Shariff has also stated that injury found on Tanvi could be caused by hard blunt substance.

In our considered view, the expert opinion of Dr. Shariff that the injuries of the accused were self-inflicted or caused by a friendly hand should not be accepted. It is quite evident that the accused had sustained multiple injuries on her head and one of such injuries was bone deep and if a little more force was used in causing the said bone deep injury, the skull might have fractured. Dr. Manek who had examined the accused, has clearly stated that such injuries could not be self-inflicted. It is the specific case of the accused that she was hit on the head by '*hathodi*' meaning thereby a small hammer like object, Dr. Shariff has specifically stated that he had given his opinion that the injuries could not be caused by a hammer on the footing that a heavy and big hammer had been used. It is also quite clear that the accused had suffered the eye injury on account of severe blow by a blunt object and it had been stated by Dr. Manek that such injury cannot be self-inflicted injury. Such a view has also been expressed by Dr. Shariff. It may be stated here that Dr. Manek had actually examined the accused and had noted the injuries himself, but Dr. Shariff gave his opinion only on the basis of the injury report and the X-ray report without even looking to the X-ray plate. In such circumstances, we are inclined to rely more on the opinion of Dr. Manek than on the opinion of Dr. Shariff. We are also of the view that the injuries caused on the eye of the accused and also one of the injuries on the head were quite serious and it was highly improbable that the accused would invite such injuries to be caused by a friendly hand. We may also indicate here that the infant baby aged only six months had also suffered injuries and the doctor has given opinion that the

abrasion suffered by the infant was possible by contact with a blunt object and could be caused by a fall and the diffused swelling found on the infant reflected the manifestation of some internal injury. In our opinion, it is also highly improbable that such injuries could be caused on the infant of six months either by the accused herself who was mother of the child or she would allow anybody to cause such injury voluntarily to give a show that infant along with herself had been attacked. On the contrary, the nature of the injuries suffered by the infant fits in with the statement made by the accused indicating the manner in which the infant was dealt with by the assailant thereby causing the injuries on the child. On a careful consideration of expert opinion and the evidence adduced regarding the injuries suffered by the accused and the infant child, we have no hesitation to hold that such injuries suffered by the accused and the infant were neither self-inflicted nor caused by any friendly hand.

So far as to the probable time of death of the deceased after receiving injuries is concerned, Dr. Shariff has given an expert opinion that the time of the death of the deceased was 10 or 12 hours prior to the time of the post-mortem examination which was held from 7.30 to 9.30 am next day. If the deceased had been attacked some time after 8.30 pm on the previous night then according to the opinion of Dr. Shariff, the probable time of death of the deceased was about 6.30-9.30 pm being 10 to 12 hours prior to the post-mortem examination. Dr. Shariff has based his opinion only on the basis of post-morterm report and notes on post mortem report and also taking into consideration the presence of *rigor morits*, lividity, coolness and the report of injuries found on the person of the deceased. Dr. Shariff has stated that common carotid bifurcates into internal and external carotid and he had indicated that he had presumed that common carotid was cut looking to the words 'carotid artery' used in post-mortem report. The doctor who actually held the post-mortem examination, has specifically stated that carotid was not completely cut and injury was situated on the posterior aspect of the carotid but Dr. Shariff did not agree with such view by noting to the words 'carotid artery' in the post-mortem report. Dr. Shariff has also deposed that in the out patient case papers, it was mentioned that the body of the deceased was cool when she was examined in the hospital but he has admitted that there was no mention of body temperature of the deceased in the case paper and he has also deposed that the mention of coolness must have been made by touching the body. Dr. Shariff has also stated that in the post mortem report, there was no mention of atmospheric temperature, humidity and movement of air. He has admitted that without assessment of these factors, proper estimate of the time for setting of *rigor mortis* cannot be given. He has also stated that *rigor mortis* was only a rough guide for determining the time of the death and he has also agreed that onset of *rigor mortis* will be quicker if the muscles are feeble and exhausted and that in case of cut throat injury, *rigor mortis* sets in early. It is, therefore, quite apparent that in the absence of various factors which had not been noted by any doctor considering which the probable time for onset of *rigor mortis* and estimation of probable time of death with reference to the state of *rigor mortis* and coolness of the body can be fairly estimated, any opinion as to the time of death therefore cannot be held to be wholly reliable. We may also indicate here that the doctor who had held the postmortem examination had occasion to see the injuries of the deceased quite closely. In the absence of any convincing evidence that the doctor holding post-mortem examination had deliberately given a wrong report, his evidence is not liable to be discarded and in our view, in the facts of the case, the opinion of the doctor holding post mortem examination is to be preferred to the expert opinion of Dr. Shariff .[43]

23.14.37 Digestion Time Variable[44] (Not Proper Guide to Time of Death)

We have given our thoughtful consideration to the submissions made at the Bar and have with the assistance of learned counsel for the parties examined the judgments of the courts below as also the material evidence in the case.

44. *Mani Ram v State of Rajasthan*, AIR 1993 SC 2453 : 1993 AIR SCW 1885 : 1993 Cr LJ 2530.

We are in agreement with the High Court that the evidence of P.W. 1 Surjeet Kaur and P.W. 2 Jaskaran has not been viewed and considered in the correct and proper perspective by the trial court and undue and unwarranted emphasis had been attached to certain minor discrepancies. Our independent appraisal of the evidence of both the witnesses P.W. 1 and P.W. 2, the widow and son of the deceased, shows that they are consistent in their versions not only about the assailants but also about the manner of assault, as has been noticed by us in the earlier part of this judgment. Both the witnesses have given a vivid description of the occurrence. The statement of P.W. 1 Surjeet Kaur that Hazur Singh took his meals at about 10.30 am and that the occurrence had taken at about 12-12.30 in the noon cannot be taken to have been contradicted by the medical evidence. Indeed, in the post-mortem examination, Dr. K.C. Mittal P.W. 9 found semi-solid undigested food in the stomach of the deceased. The doctor opined that digestion begins in 1 or 1-one-second hours. From this testimony what was sought to be made out by the defence was that had the occurrence taken place at 12.30 noon, the deceased would have had his meals before 11-00 a.m. as semi-digested food was found in the stomach of the deceased. The emphasis on this aspect of the case by the trial court, in our opinion misplaced not only because the medical evidence is only an evidence of opinion and hardly decisive but also because when Dr. K.C. Mittal P.W. 9 stated that digestion begins in 1 or 1-one-second hours, he did not clarify as to what was the extent of the undigested food in the stomach of the deceased. The process of digestion depends upon the digestive power of an individual and varies from an individual to an individual. It also depends upon the type and amount of food taken. The period of digestion is different for different types of food. Some food articles like mutton, chicken would take more time of being digested compared to vegetarian food. No question at all were asked from the wife of the deceased about the type of food served to her husband or the amount of food taken by the deceased. That apart, the time stated by the witnesses as to when the deceased took his food was only an approximate time as it was not even suggested to P.W. 1 that she had a wrist watch and had actually seen the time when her husband took his food. Too much play on such slippery factors goes against realism and is not enough to discredit the otherwise reliable testimony of P.W. 1. In our opinion, the evidence of P.Ws. 1 and 2 does not stand contradicted by the medical evidence at all and as a matter of fact, the presence of semi-solid undigested food in the stomach lends support of the testimony of the two witnesses that they had gone to the field later on with the food for the deceased and had actually served meal to him. It lends assurance to their presence in the field with the deceased. Despite the lengthy cross-examination, nothing was brought out in the cross-examination of either of these two witnesses which could affect the veracity of their testimony. The first information report was lodged by Surjeet Kaur. P.W. 1 at 3.00 pm at a distance of about 15 miles from the place of occurrence and was therefore lodged with great promptitude and the entire version of the occurrence finds mention in that report. The testimony of both the witnesses has impressed us and they appear to us to be truthful witnesses and being the close relations of the deceased would, in the ordinary course of things, be the last persons to screen the actual offender and implicate the appellants falsely. Their testimony also receives ample corroboration from the medical evidence and the testimony of ballistic expert Shri G.R. Prasad P.W. 11.

Dr. Mittal P.W. 9, as already noticed, found six injuries on the deceased and opined that the same were sufficient in the ordinary course of nature to cause the death. In the FIR Ex. p 1 lodged soon after the occurrence P.W. 1 Surjeet Kaur had stated that Mani Ram appellant had fired 3-4 shots after he had fired the first shot on her husband. At the trial, she however, could not state exactly as to how many shots had been fired by the appellant from his pistol. That is not surprising because she could not be expected to keep an exact account of the shots fired by the appellant, when she found her husband being shot at and having fallen down dead. She categorically attributed the gun shot injuries to the appellant and did not attribute

any injury to the acquitted accused Hari Ram. Since, it has been found that the recovered empties had been fired from the pistol of the appellant, it lends sufficient corroboration to her testimony. We may ignore the testimony of Sukh Ram P.W. 4 as a matter of abundant caution but that would not in any way detract from the reliability of the testimony of P.W. 1 and P.W. 2.

The pistol, weapon of offence, was taken into possession from the appellant by P.W. 6 SHO Bhim Singh. It is a licenced pistol of the appellant. According to the evidence of ballistic expert P.W. 11, the empty cartridges sent to him for examination had been fired from that pistol and that pistol alone and from no other similar weapon. Of course, the sealed packets containing the pistol and the cartridges were sent to the ballistic expert after a long delay and that could have created some doubts about the possibility of substitution of the cartridges, while the packets remained with the police but the evidence on the record rules out any possibility of such a substitution. The three sealed packets, one, containing pistol, the second, containing the empty cartridge recovered from the spot and the third, containing the three empty cartridges recovered from the appellant along with the pistol, were deposited in the *malkhana* of the police station. They had been received by Head Constable Mani Ram P.W. 10 on 23 June 1972, the very next day after the occurrence. He had sent the same to the police lines at Ganganagar. The prosecution examined P.W. 12 Amar Singh who had carried the three packets from the police station to the police lines at Ganganagar. He categorically stated that while the packets remained with him, they were not tampered with at all. P.W. 10 Mani Ram also deposed that during the period, the sealed packets remained in the *malkhana*, they were not tampered with by anyone and that they were handed over to Amar Singh P.W. 12 in the same condition. According to P.W. 7 Ram Chandra, he received the three packets from Amar Singh and after taking them into custody he made an entry in the register and that while the packets remained in his custody, nobody tampered with them. The packets were sent to the ballistic expert and received there by Jaswant Singh P.W. 8 and Manraj Singh. Jaswant Singh, appearing as P.W. 8, deposed that he delivered the packets to the ballistic expert on the very next day after receiving them and while the packets remained in his custody, nobody tampered with them. According to the ballistic expert, P.W. 11, the packets when received by him were properly sealed and the seals were intact and tallied with the specimen of the seal sent to him. None of these witnesses were at all cross-examined. No suggestion even was made to anyone of them that the sealed packets had allegedly been tampered with while in their custody. No such suggestion was even made to SHO Bhim Singh P.W. 6 that he had either substituted the cartridges sent to the ballistic expert or otherwise tampered with the sealed packets. It is, therefore, futile to contend that the possibility of the substitution of the cartridges could not be ruled out. There is no basis for such an argument. The evidence of the ballistic expert, Shri G.R. Prasad P.W. 11, read with the medical evidence of P.W. 9 and the testimony of the eye-witnesses P.Ws. 1 and 2 clearly establishes that the appellant had fired from his licenced pistol at the deceased and that the deceased died as a result of the pistol shot injuries received by him. We agree with learned Judge of the High Court that there are no suspicious features at all appearing in the evidence which may cast any doubt on the prosecution version that the deceased was shot at with the pistol by the appellant and that he died as a result of the injuries so received.[44]

23.14.38 Doctor's Unprofessional Conduct[45]

We need to take note of the fact that in this as in all other rape cases there are not going to be eye-witnesses nor are there going to be witnesses to the actual incident. Invariably the

45. *State of Karnataka v Rangaswami*, 2003 Cr LJ 607.

Court is required to accept or reject the testimony of the victim and if the evidence is good enough, it is usually supported by the medical evidence and forensic evidence. In the present case, the evidence of PW-5 Jayamma is not supported by PW-I because he has given totally non-committal evidence and it is clear that he has been won over. Jayamma's evidence is very clear with regard to the aspect of identifying the four accused. It is also very clear about the fact that pursuant to their common intention she was held down by the accused persons and two of them raped her. She has also stated that the bite injuries on her breast were sustained in the course of this incident. The real difficulty that has arisen in this case arises from the fact that PW-12 Dr. Sujatha in her evidence states that Jayamma had complained of an attempt to rape and not actual rape. Whereas Dr. Ashalatha accepts the position that Jayamma had complained of having been raped. The doctors in this case, obviously because Jayamma is a poor villager, did not seem to have evinced the requisite interest nor have they acted responsibly and professionally as one would expect in a case where there is a serious charge of rape. The manner in which they have conducted themselves is cavalier, to say the least, and the same is the manner in which they have given evidence before the Court. Thanks to this totally disinterested and non-professional attitude that the Court is left with virtually zero assistance from the medical evidence. We do expect that the members of the medical profession and particularly doctors who are working in the public hospitals should grasp the seriousness and the horrifying consequences of the offence of rape and other sexual assaults and that they should act with a far more professional, responsible and considerate manner. The fact that such an incident took place is bad enough and the fact that because of this type of handling in the hospitals the Courts are forced to acquit the accused is compounding injustice and it is high time that the medical profession realises the damage that it is doing and acts in the manner which the law and the Courts expect of them.

This Court has found that time and again, the medical evidence in almost every case of sexual assault on women is tampered with and that the doctors come out with evidence that can only be termed as "pro-accused". It does not require much intelligence to see through these malpractices which clearly indicates that there is a very serious integrity problem at this level. We have come across instances where the doctors have brazenly given evidence that has virtually sabotaged the prosecution case as has happened in this instance and we wish to appeal to the conscience of each of these doctors, assuming they possess one, that it is because of what is happening in the hospitals that 94% of the rape cases in this State are ending in acquittals. We do not propose to close our eyes to this state of affairs and direct the Government to immediately formulate adequate safeguards to ensure that there is a full-stop to these illegalities.

CHAPTER 24

SEXUAL OFFENCES

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24.1 INTRODUCTION

Common serious sexual offences are:

1. Rape
2. Incest
3. Unnatural offences
4. Exhibitionism
5. Sadism
6. Voyeurism — "Peeping Tom"
7. Frottage
8. Masochism
9. Transvestism
10. Fetishism

24.2 RAPE

In India, rape is one of the most serious offences. The victims sometimes cannot bear the sense of shame and commit suicide. Law (section 375 of the Indian Penal Code) also provides severe punishments — imprisonment and fine. The prison term can be even for life.

Legally speaking:

> a man is said to commit rape who, except in the case hereinafter excepted, has sexual intercourse with a woman under circumstances falling under any of the five following descriptions:
>
> ***Firstly,*** against her will;
>
> ***Secondly,*** without her consent;
>
> ***Thirdly,*** with her consent, when consent has been obtained by putting her in fear of death, or of hurt;
>
> ***Fourthly,*** with her consent when the man knows that he is not her husband and that her consent is given because she believes that he is the man to whom she is lawfully married;
>
> ***Fifthly,*** with her consent, when, at the time of giving such consent, by reason of unsoundness of mind or intoxication or the administration by him personally or through another of any stupefying or unwholesome substance, she is unable to understand the nature and of that to which she gives consent.
>
> ***Sixthly,*** with or without her consent when she is under eighteen years of age.
>
> ***Explanation*:**
>
> Penetration is sufficient to constitute the sexual intercourse necessary to the offence of rape.
>
> ***Exception:***
>
> Sexual intercourse by a man with his own wife not being under eighteen years of age is not rape.

In simple non-legal words, rape means forceful sexual intercourse with a female (other than his wife) by a person when:

1. the female is not willing, even if she is a harlot,
2. the consent obtained by coercion,
3. the consent is obtained by deceit or misrepresentation (posing as her husband or misrepresenting the act as medical treatment),
4. the victim is mentally deficient: imbecile or idiot,
5. the victim is under the influence of drugs or liquor,
6. the person is unconscious,
7. the victim is young — below the age specified in law (18 years), and
8. the penetration of male organ into the female parts incurs the offence. Complete penetration or emission of semen is not necessary to prove the charge.

24.2.1 Rapist

Rapists are of four types:

1. Social degenerates: Some individuals who enjoy extra-marital sexual intercourse without ill-feeling. They are the real criminals.
2. Sex maniacs: Some individuals, though ordinary most of the times, get fits of sex mania and commit acts for which they are often sorry later on. They need medical treatment or psychiatric treatment as their biology may be responsible to urge/push them on to commit the crime.

3. Misguided: Some misguided individuals suffering from venereal disease believe that intercourse with a virgin would cure their venereal disease. They rape young girls.
4. Sex starves youngsters living in cities.

24.2.2 Investigator's Role

It is easy to level a charge of rape against a person, but it is difficult to prove it. The number of cases is increasing. It is increasing further because of the changing social values, falling moral values and increasing psychological insensitivity: no compunction at the sufferings and pains of the victims.

The government has made strict laws in 2013, but it seems they have no deterrence effect upon the culprits. The investigator has to be more vigilant.

The investigator has to proceed systematically to collect proper evidence and to provide proper proof as in cases of rape; there are usually no eye-witnesses. It is complainant's statement *versus* the accused person's statement. Of course, circumstantial evidence (and hence scientific evidence) is available. As the culprit and the victim come in close contact, there is plenty of exchange of traces. If the case is handled early and efficiently, convincing irrefutable evidence should be forthcoming.

Two problems worry the investigator. First, the culprit often claims consent of the victim. Second, there are sometimes false allegations. He has to keep these aspects in mind while investigating.

24.2.3 The Victim

The victim is the most crucial source of evidence in rape cases. The evidence is of three types:

1. Knowledge of the occurrence
2. Medical evidence
3. Evidentiary clues

24.2.3.1 Knowledge

The occurrence is best known either to the victim or to the culprit. As culprit is not interested in conveying the information, the only source left is the victim. The victim is also reluctant, bowed down by shame and uninitiated legal processes. This knowledge has to be extracted through careful sympathetic interrogation so that the chaff can be separated from the grains. The following points must be kept in view:

1. Interrogate the female in the presence of another female.
2. Ascertain the movements of the victim before and after the occurrence.
3. Ascertain the familiarity of the accused with the victim.
4. Collect even minute details of the occurrence:
    a. Place of occurrence
    b. Route and mode of transport
    c. Time of occurrence
    d. How enticed?
    e. How attacked?
    f. Weapon, if any.
    g. Resistance offered, if any. How was it overcome?
    h. How long did the act last?
    i. Dialogue or other sound at the time? Screams? Threats? Inducements? Endearments?
    j. Any witnesses who may have seen the pair together before or after the act?

These may help to know the *modus operandi* of the culprit, which helps to link or de-link the criminal with other similar crimes.

5. How soon after the occurrence was the complaint made? And to whom?
6. Who persuaded the victim to go to the police?
7. Ascertain the character of the victim. Previous sexual contacts with the accused may indicate a motive.

24.2.4 Medical Evidence

Both the culprit and the victim carry vital evidence. They are lost with the passage of time. Their medico-legal examination should, therefore, be carried out at the earliest.

Consent of the adult victim for medical examination is required legally. If she is minor, parents or guardians are approached for the consent. An experienced female medico-legal expert carries out the medical examination. It ascertains:

1. Are injuries consistent with violent and forced rape?
   - Evidence of forced sex act
   - Previous sex experience
   - Torn hymen
   - Injured vulva
   - bleeding
2. **Resistance Injuries**: their location, number, and extent are noted/described. They are often found both on the culprit and the victim if the female is healthy and spirited. Both are checked for:
   - Bite marks
   - Scratches
   - Signs of beating
3. **Torn clothes:** they should be taken into possession.
4. **Stains:** on clothes, body, especially on thighs and private parts?
5. Disorder of hairs, clothes?
6. **Any pregnancy**? How old?
7. **Age. Physical health**.
8. **Disease:** is the victim suffering from any venereal disease?
9. **Smegma:** presence of smegma is useful clue. It can refute the charge of false rape. Absence of smegma does not prove rape.
10. **Capability:** some accused person profess impotence.

24.2.5 Evidentiary Clues

The investigator must collect all the evidentiary clues with the help of the doctor, including the following:

1. Vaginal secretion and swabs for semen.
2. Foreign hairs and fibres on the person of the victim.
3. Specimen pubic hairs from the victim.

4. Semen stains from the body.
5. Fingernail scraping which may carry fibres, hairs, skin, blood from the culprit. The evidence can link the culprit, with the victim and hence with the crime.
6. Age of the victim often assumes great importance. Medical evidence for the age of the victim is important. It should be ascertained. However, a birth certificate and school certificates also prove useful. If the victim is less than 18 years of age, consent of the victim does not have any sanctity.
7. All clothes of the victim worn at the time of occurrence. They carry semen, fibres and hair, bloodstains, saliva stain from the culprit. They also indicate the extent of bleeding.

   Sometimes they carry dust, dirt, plant materials from the scene, which help to corroborate the victim's statement.

24.2.6 The Culprit

The culprit, per Locard's principle of exchange, must also carry important evidence, similar in character to that of the victim. The evidence is medical, physical and knowledge of the occurrence. He should be contacted and got medically examined at the earliest with his consent.

24.2.7 Medical Evidence

The medico-legal expert collects clues like stains, injuries, and trace evidence from the person of the culprit on the same pattern as in the case of the victim. They must be processed properly so that their authenticity, integrity, and chain of custody are not disturbed.

Collection of the above evidence should be done at the earliest so that the evidence is not lost.

24.2.8 Physical Evidence

The culprit carries the following evidentiary clues on his person:

1. Vaginal fluid stains, bloodstains, semen stains on the penis, on pubic hair, on the area around the male organ and thighs and on clothes. Smears from the male organ from pubic hair, from the surrounding skin, should always be obtained.
2. Foreign hairs — especially in the private parts and intermingled with pubic hairs. The doctor should collect them for further investigations.
3. Fibres from the clothes of the victim are often transferred to the culprit. They are mostly on his clothes.
4. Stains of cosmetics (lipstick, cream, powder) on the person and clothes.
5. The fingernail scrapings may contain vaginal fluid, skin, fibres, and cosmetics from the victim.
6. Dust, dirt, flora or fauna from the scene, especially in outdoor case

Clothes worn by the culprit at the time of occurrence must be taken into possession. They carry stains, tears, hairs, and fibres, flora and fauna and their fragments and dust and dirt from the scene.

24.2.9 Oral Evidence

The IO acts to:

1. Get the version of the accused and compare it with that of the victim.
2. Verify culprit's *alibi*.

3. Fix time frame of his movements around the time of occurrence. Find out their correctness.
4. Ascertain the association of the accused with the victim. Previous meetings? Previous sexual inter-course?
5. Ascertain the reason for the presence of the accused at the scene.
6. Ascertain reputation of the accused, his social and marital status, previous crimes, if any.
7. Ascertain his associates.

24.2.10 The Scene

The crime scene is the most important source of evidence, physical clues and *modus operandi*. It, therefore, demands extreme care in its processing. A careful examination of the scene of occurrence is always done at the earliest. The investigator takes steps to:

1. Document the scene (Video clips, Photographs, sketches, and textual narration).
2. Collect evidence:
   a. Hairs, fibres, discarded papers, pieces of cloth, clothing, cigarette stubs, and buttons.
   b. Stains, smears.
   c. Marks: fingerprints, footwear marks, tyre marks, lipstick marks, marks of struggle
   d. Soil, dust, dirt as a control sample for evidence picked up by the culprit and the victim.
   e. Broken bangles, jewellery
3. Ascertain the layout. Could anybody observe the scene and occurrence? Could anybody hear the screams or voices from the scene?
4. Ascertain if there was any chance witness to the occurrence.

24.2.11 Gang Rape

Gang rapes were a rare phenomenon in olden days. The influence of western culture has gifted the evil to India also. Gangsters, group of sex-starved employs rowdy delinquents join hand and gang-rape unfortunate females of all ages, often finishing the 'job' with murders. The menace is increasing by the day in spite of the government's professed intentions to curb it. The victim is raped by one after the other. All are accomplices and are equally guilty.

> *In a recent brutal gang rape and murder case, there were five rapists and murderers. Session Judge sentenced four of them to death and the fifth being a minor was awarded the maximum punishment under the law (September 2013) . The SC maintained the sentence*[1]*. (CH)*

24.2.12 Attempted Rape

Attempt to commit rape is also a serious crime. Here the culprit does everything to accomplish the crime, but due to certain unforeseen occurrence, he fails to complete the act. Proof has to be provided. All evidence available with the victim, the culprit and the scene should be collected. In genuine case, as the victim is assaulted, there is ample evidence available. It is processed in the same way as in the case of rape.

1. It is a landmark case, in Nirbhaya. where Forensic Science has been used extensively for proof beyond a reasonable doubt by the trial court, the High Court, and the Supreme Court.

24.3 INCEST

Incest is sexual intercourse between persons of prohibited relationship. For example, a person cannot have sexual intercourse with his sister, daughter, granddaughter, mother and some others.

It is believed that the number of cases of incest is quite large in India. However, they do not come to light due to social inhibitions. The few cases which are exposed are treated legally like rape.

> *In a case, reported by the mother of the girl, father was involved in the incest. When the daughter was checked, she was found to be used to sexual intercourse. Vaginal swabs did not reveal any sperms. They indicated the presence of some silicone grease. It was found similar by infrared spectrophotometry, to the one found on the contraceptive sheaths recovered from the father. (CH)*

Investigation of incest follows the rape route.

24.4 HOMOSEXUALITY

Intra-sex, sex gratification is known as homosexuality. It is unnatural offences under Indian law. Section 377 of the Indian Penal Code deal with the offence:

> *Whoever voluntarily has carried intercourse against the order of nature with any man, woman, or animal, shall be punished with transportation for life or with imprisonment of either description for a term which may extend to ten years and shall also be liable to fine.*

Homosexuality exists in all societies, and perhaps it always existed. It is more frequent where persons are sex-starved. Sailors on the sea, students in boarding houses, and convicts in confinements (jails) practice homosexuality.

Homosexuality was considered a troublesome social problem previously. It is widespread. It is estimated that in the USA more than 4% of males are hard-core homosexuals. Homosexuality carried Stigma in days gone by, not now, extortionists blackmail homosexuals. In the USA in 1967, Federal Bureau of Investigation broke up a gang of 70 extortionists. Among their victims were some of the top rankers of the society — university professors, generals, and politicians.

Homosexuality has since been legalized in the USA and some other countries. Gay marriages have become legal. In India, there is serious thinking going onto legalise homosexuality after making section 377 null and void.

In India, there is a class of people called Hijrahs. They are eunuchs (transgender) — who are neither male nor female. They act as male prostitutes. They also steal young boys, castrate them, and put them for passive pederasty.

Homosexuality is of two varieties:

- Sodomy
- Lesbianism

24.4.1 Sodomy

Sex gratification through anal intercourse is called sodomy. It is also called buggery or paederasty. Sex act through the mouth, called fellatio or oral sex, may also be classed as a form of sodomy.

The passive agent may be an adult male, a young boy, a eunuch or even a female.

Sodomy may be by mutual consent. If it is so and if it is performed in privacy, it does not become a police problem for investigation. If, however, sodomy is carried out by force, or by deceit, or in public places, it becomes a police problem. The police investigation in such cases follows the rape case pattern. The types of evidence collected are:

1. The oral evidence of the victim and of the culprit. Usually, there are no witnesses.
2. Medical evidence from both the culprit and the victim.

3. Physical evidence associated with the act and picked up by the partners from the scene of occurrence or exchanged mutually.

In an unusual case a child of six was brought to the hospital with an injured anus. It was reported that the pet dog in a sudden frenzy climbed over the child and repeatedly introduced his sexual organ in the anus of the child. It was suspected that perhaps some member of the family in a moment of mental aberration might have carried out the act. The family might have concocted the story to protect the member of the family. The dog had allegedly been killed. The swabs taken from the anus revealed the truth: The dog had actually attacked the child. (CH)

The three sources for evidence are the victim (passive partner), the culprit (the active partner) and the scene. The evidence is located, collected and evaluated as in the case of rape, already discussed.

24.4.2 Lesbianism

Lesbianism is sexual interaction among females for sexual gratification. It is also known as tribadism or female homosexuality. It is less common. It does not appear as a police problem. Lesbianism comes to surface only when a male goes in for a divorce from his wife alleging her to be a lesbian.

Lesbianism takes many forms. It may be simple fiddling of the body parts especially private parts. It may be intercourse like attempt with clitoris if it is sufficiently enlarged. Or, it may be an artificial penis, used by one woman to gratify another or for self-gratification.

In an interesting case two women lived as husband and wife. The 'husband' had manly bearings and used an artificial penis. The 'wife' could know the fact that 'he' was a 'she' only after the latter's death. (CH)

24.5 BESTIALITY

Sexual intercourse with animals through vagina, anus or any other orifice, usually by a male is called bestiality. This sexual offence is not very common but it does take place. Usually, youths in rural areas and mentally deficient persons indulge in these sex acts. The animals reportedly misused are goats, cows, buffalos, mares, asses, bitches and even hens.

The proof of the act is usually established through eyewitness accounts and through scientific evidence, which may be as under:

1. Injury to culprit, animal or to both
2. Presence of semen or spermatozoa in the orifice or on the coat of the animal
3. Animal faeces on the male organ, private parts and/or on the clothes of the culprit
4. Animal hair on the person of the culprit
5. Detection of disease germs if the culprit is suffering from venereal disease, on the animal
6. Semen or semen smeared objects at the scene
7. Semen on the clothes of the culprit

Some women use dogs for the sex act.

24.6 EXHIBITIONISM

Certain persons derive sexual pleasure if they expose their sexual organs to the public or before certain individuals. Some of them may even masturbate in public. All these persons offend

the public by their indecent behaviour. They, therefore, are liable for punishments for causing public nuisance under section 294 of the Indian Penal Code.

The cases of exhibitionism do occur in India also but only a few and far in between.

24.7 SADISM

This is an unfortunate sexual perversion performed mainly by male sexual partners on the female partners. The mildest form of the disease is to carry out the sex act violently and the worst is to murder the partner and then carry out the sex acts. In between, the sadistic act forms vary tremendously. Pinching, biting, beating, flogging, injuring are all its forms. All this ill-treatment gives the sadist sexual satisfaction. Without these, the sex urge of the person is not excited.

24.8 VOYEURISM

A person suffering from voyeurism gets sexual pleasure when he observes the sexual organs of other persons or sex act being performed by others. Some of these perverts are so overcome by the desire to see the act that they trespass into premises of others and thus make them liable for legal action. If they can watch the act from their own residence, no action can be taken against them.

> *In colonial days one bachelor British Deputy Commissioner was so much fascinated by the sexual act of horses that he had given instruction to the veterinary hospital staff to call him when a mare in heat was brought to the hospital for mating. He would observe the mating process. (CH)*

24.9 FROTTAGE

In frottage sexual perversion, the pervert derives pleasure in rubbing against certain anatomical parts of females. Usually, he does so in crowded places like while travelling in buses, trains, or in cinema halls. Often he gets away with the perversion. He is sometimes caught and is taught a lesson for the misdemeanour.

24.10 MASOCHISM

Masochism is a sexual aberration in which the aberrant wants to be physically maltreated by his sexual partner, beating, biting, crushing, pinching painfully, are some of the physical tortures, which the masochist enjoys for sexual satisfaction. Some need even severer treatment. Others may derive sexual satisfaction from the maltreatment alone.

24.11 TRANSVESTISM

In transvestism, the person simulates other sex in dress, mannerism, and behaviour. Transvestism is quite common in India. The Hijrahs (eunuch) who practice as male prostitutes wear the female dress. They simulate female physical features such as wearing long hairs, putting on artificial breast balls. They use cosmetics to appear as females.

There is no law against the same in India.

Female Transvestism is becoming popular. Modern girls tend to keep short hairs and wear n shirt and trousers.

24.12 FETISHISM

Fetishism is a sexual aberration in which the aberrant derives sexual pleasure from a female's article of wearing apparel, ornament or even from shoes. The aberration is inoffensive most of the time, but sometimes the person starts stealing these articles. He thus becomes a criminal.

24.13 ADDITIONAL READINGS

1. Subramanyam, BV. *Modi's Medical Jurisprudence and Toxicology.* Butterworth, New Delhi.
2. Polson, *e.g. et al. The Essentials of Forensic Medicine.* Pergamon Press, New York.
3. Simpson, K. *Taylor's Principles and Practice of Medical Jurisprudence.* J & A Churchil Ltd London.

24.14 CASE LAW

24.14.1 Nirbhaya Rape-murder[2]

Author's Summary

It is a landmark judgment where the judges have utilised Forensic Science extensively for the dissemination of justice in this case of inhuman brutal rape- murder case.

The facts of the case are that the victim Nirbhaya, along with her friend (PW- 1) boarded a bus going to Dwarka/Palam. They noticed that six persons were already inside the bus. The accused did not allow anyone else to board. The bus moved and they put off the lights. A few minutes later, three persons (identified as accused Ram Singh, Akshay and a juvenile) started to abuse. Pw-1 objected that led to altercation. The two other joined the melee. PW-1 was beaten badly. He became immobile. Nirbhaya was raped by all the six and mauled so beastly/brutally that she died a few days later, in spite of the best medical help.

The police did an excellent job of locating and using all the available scientific evidence (CCTV footage for the identification of bus, fingerprints, bite marks, hair, DNA to inter-link the victims and the culprits) and presented an airtight case.

All the courts (trial, high court and the Supreme Court) appreciated the evidence. They found it **'rarest of the rare cases'** and sentenced them to death, excluding the juvenile.

Highlights italicised

The prosecution case, as projected, is that on 16 December 2012, the deceased, 'Nirbhaya' (not her real name), had gone with her friend, the informant, PW- 1, to the PVR situated in Select City Walk Mall, Saket to watch a movie. After the show was over, about 8:30 p.m., they took an auto and reached Munirka bus stand wherefrom they boarded a white coloured chartered bus [DL- 1P-C-0149, Ext.P1] which was bound to Dwarka/Palam Road, as a boy in the bus was calling for commuters for the said destination. As per the version of the informant, PW-1, the friend of the prosecutrix, the bus had yellow and green lines/stripes and the word "Yadav" was written on it.

After both of them had entered the bus, they noticed that six persons were already inside the bus, four in the cabin of the driver and two behind the driver's cabin. The deceased and the informant sat on the left side in the row of two-seaters and paid the fare of twenty rupees as demanded. Before they could get the feeling of a safe journey (though not a time-consuming

2. *Mukesh v State for NCT Delhi*, Criminal Appeal Nos, 607–08 of 2017, SC, decided on 5 May 2017. Bench: Dipak Misra, R Banumathi, and Ashok Bhushan.
The Supreme Court has discussed the evidence relating to DNA, Bite Marks, and Fingerprint lucidly, with numerous case citations.

journey), a feeling of lonely suffocation and a sense of danger barged in, for the accused persons did not allow anyone else to board and the bus moved and the lights inside the bus were put off. With the lights being put off, the darkness and the fear of the unexpected darkness ruled.

A few minutes later, three persons (who have been identified as accused Ram Singh, Akshay and a young boy, who has been treated as a juvenile in conflict with law) came out of the driver's cabin and started to abuse PW- 1. The young companion of the deceased raised opposition to the abuse that led to an altercation which invited the other two who were sitting outside the driver's cabin to join.

The spirit to oppose and the duty to save the prosecutrix had to die down and perilously succumb to the assault by the accused persons with the iron rods that caused injuries to his head, both the legs and other parts of the body and the consequence was that he fell on the floor of the bus to hear the painful cries of the lady who, he knew, was being treated as an object, an article for experimentation and prey to the pervert proclivity of the six but could do nothing except to hear unbearable cries made in agony and pain. His spirit was dead, and bound to.

As the prosecution story further unfurls, the two accused persons, namely, Pawan and Vinay, pinned the young man down and robbed the victims of their mobiles besides robbing the informant of his purse carrying a Citi Bank credit card, ICICI Bank Debit Card, his identity card issued by his employer-company, metro card, a sum of rupees one thousand, his Titan Watch, a golden ring studded with jewels and a silver ring studded with pearl, black colour Hush Puppies shoes, black colour Numero Uno jeans, a grey colour pullover and a brown colour blazer. As per the version of the prosecution, PW-1 was carrying two mobiles and the prosecutrix was carrying only one, and the accused snatched away all the three mobiles.

The overpowering was not meant to satisfy the avarice. As the accusations proceed, after the informant was overpowered, as it could only have a singular result, the accused persons, namely, Ram Singh, Akshay and the Juvenile in Conflict with Law (JCL) took the prosecutrix to the rear side of the bus and she was raped by them, one after the other.

After committing rape, the accused Ram Singh (since deceased), accused Akshay and the JCL came towards the informant, PW-1, and nailed him down; then the accused Vinay and accused Pawan went to the rear side of the bus and committed rape on the prosecutrix, one by one. PW-1 noticed that earlier the bus was moving at fast speed but after sometime, he felt that the speed of the bus was reduced and he saw that the accused Mukesh, who was driving the bus, came near him and hit him with the rod and he also went to the rear side of the bus and raped the prosecutrix.

The prosecutrix was brutally gang raped by the accused one after the other and she was also subjected to unnatural sex. Her private parts and her internal organs were seriously injured by inserting iron rod and hand in the rectal and vaginal region. As per PW-1, he had heard the cries of the prosecutrix like "chod do, bachao". PW-1 could hear the prosecutrix shouting in a loud oscillating voice. The prosecutrix was carrying a grey colour purse having an Axis Bank ATM card and other belongings.

The accused persons robbed her of her belongings and stripped her. They also took away the clothes of the informant while beating him with iron rods. The accused were exhorting that both the victims be not left alive. The accused then tried to throw both the informant and the prosecutrix out of the moving bus from its rear door but could not open it and so, they brought them to the front door and threw them out of the moving bus at National Highway No. 8, Hotel Delhi 37, Mahipalpur flyover by the side of the road.

227. After establishing the identities of each of the accused persons, the informant and the prosecutrix through DNA analysis, ***the DNA profiles*** *generated from the remaining samples, where*

the identity of biological material found thereon needed to be ascertained, were matched with the DNA profiles of the prosecutrix, the informant and the accused, generated earlier from known samples. Such an analysis cogently linked each of the accused with the victims as also with the crime scene. A summary of the findings in the report submitted by PW-45, Dr. B.K. Mohapatra, is as under:

"S.No.	*Accused*	*DNA Evidence*
1	*Ram Singh*	*Rectal swab from the prosecutrix contained DNA of male origin, which was found consistent with the DNA developed from the blood sample of this accused.*
		DNA profile developed from the blood stains from the underwear, T-shirt and slippers of this accused was found consistent with the DNA of the prosecutrix.
2	*Mukesh*	*DNA profile developed from the blood stains from the pants, T-shirt and jacket of this accused was found consistent with the DNA of the prosecutrix.*
3	*Akshay*	*Breast swab of the prosecutrix contained DNA of male origin which was found consistent with the DNA of this accused.*
		DNA profile developed from the blood stains from the jeans of this accused was found consistent with the DNA of the prosecutrix.
4	*Vinay*	*DNA profile developed from the blood stains from the underwear, jacket and slippers of this accused was found consistent with the DNA of the prosecutrix.*
5	*Pawan*	*DNA profile developed from the blood stains from the sweater and shoes and slippers of this accused was found consistent with the DNA of the prosecutrix."*

"Serial No.	*Identity of the victim*	*Findings of DNA Analysis*
	Informant	*The DNA profile developed from burnt clothes pieces was found to be of male origin and was consistent with the DNA profile of complainant.*
		The bunch of DNA profile developed from hair and blood stained pieces of paper recovered from the bus was found consistent with the DNA profile of complainant.
		The DNA profile developed from blood stained dried leaves collected from the place where both the victims were thrown matched with the DNA profile of complainant.
	Prosecutrix	*The DNA profile developed from blood stains from both the iron rods recovered at the instance of accused Ram Singh from bus was of female origin and was consistent with the DNA profile of prosecutrix.*
		The DNA profile developed from blood stains from curtains of the bus matched with the DNA profile of prosecutrix.
		The DNA profile developed from blood stains from seat covers was found consistent with the DNA profile of prosecutrix.
		DNA profile developed from blood stains from the bunch of the hair recovered from floor of the bus below sixth row seat, blood stains prepared from the roof of the bus near back gate, blood stains prepared from the floor of the bus near back gate, blood stains taken from side of back stairs of the bus, and blood stains taken from the inner side of the back door of the bus was found consistent with the DNA profile of prosecutrix.

228. Further, a summary of the DNA analysis of the biological samples lifted from the material objects such as the bus, the iron rods, and the ash and unburnt pieces of clothes is also worth producing here.

24.14.2 Judicial Activism in a Rape case[3]

Author's Summary

It is a case of rape and abduction. The IO failed to do his duty, which is highlighted through italicizing the relevant text s enunciated by the High court and endorsed by the SC. It is fortunate that the activism of the courts saw through the dereliction of duty and convicted the culprit u/s 376 IPC for rape and provided justice to the victim and passed strictures against the errant IO.

Highlights italicised

Relevant Extracts (Verbatim)

29. We now say something about PW-15, S.I. Bagal, who refused, to register an offence and on whom both the trial court and the High Court have commented, and in our view correctly. The trial court in paragraph 34 of the judgment observed as under:

> *It is a pathetic situation, when the citizen is confronted with the dishonest police officer. I am constrained to observe that the investigation done by S.I. Bagal P.W. 15, is not only suspicious but also dishonest and out and out in favour of the accused. I am making this observation with responsibility, I have scrutinized carefully the 3 statements recorded by S.I. Bagal, they are very cryptic and favourable to the accused. He did not care to ascertain the correct age of the victim girl, in a kidnapping and rape case. He did not register an offence against the accused. I fail to understand as to what interrogation of the accused he has done. He has obtained the signature on the statement of PW-4 Pushpa and Eknath and right hand thumb impression on the statement of Smt. Vimal for what reason, I do not understand, on three statements. At least he could have registered the offence for kidnapping after taking extract of birth from the school. If he wanted to ascertain the correct date from her father Pandurang and he was aware that PW-1 Pandurang was in K.E.M. Hospital and he wanted to obtain Hospital record, but he never cared to visit K.E.M. Hospital and to record the statement of Pandurang. He was trying to shift the burden on the Senior P.I. Sharma. Merely, he had produced these three statements in a routine manner before P.I. Sharma, on the next day. There is no guarantee that he had faithfully recorded statements of all these three witnesses. The reading of the three statements clearly indicates that those are completely in favour of the accused. The entire conduct of S.I. Bagal in the investigation has a smell of suspicion and dishonesty.*
>
> *The High Court also observed about the conduct of PW-15, S.I. Bagal as under:*
>
> *In the present case, the investigation conducted by S.I. Bagal was completely defective and casual. He has not even registered the offence. The learned trial Judge has observed that the attitude of S.I. Bagal was completely dishonest and partial to the accused. On closer scrutiny of the record, we are inclined to agree with the observations of the learned Judge. We have reason to believe that S.I. Bagal deliberately refused to register the offence in order to help the accused at the costs of the prosecutrix. But despite this deficiency, the prosecution has successfully provided the offence of rape. We have, therefore, no hesitation in confirming the conviction recorded by the trial court under section 376 of the IPC.*

30. In the facts and circumstances of this case, the comments made by the trial court and the High Court about the manner in which S.I. Bagal conducted the first investigation are well justified.

3. *Vishnu v State of Maharashtra*, AIR 2006 SC 508 : 2005 AIR SCW 6149 : 2006 Cr LJ 303 (SC).

24.14.3 Age of the Rape Victim[4]

Author's Summary

It is a case of rape where the culprit took the plea that it was a case of consent and the victim was of the age of consent. He hired a radiologist who supported his Claim. However, the SC accepted the birth entry in the register and the school record and convicted the culprit.

Highlights italicised

2. The factual matrix may be noted briefly:

The prosecutrix – Kumari Pushpa at the relevant time was residing with her parents Pandurang – PW-1 and Vimal – PW-13 at Khar Danda, Mumbai. The accused was known to the prosecutrix as they were residing in the same locality. The accused was also a friend of the maternal uncle of the prosecutrix. She used to visit her maternal uncle's house where she used to meet the accused. Pandurang, father of the prosecutrix was admitted at K.E.M. Hospital for treatment of his eyes. The prosecutrix used to take food and tea to the hospital for her father.

3. On 10th July, 1980 the prosecutrix had gone to the hospital at about 11.00 a.m. carrying food and tea for her father. She left the hospital at about 3.30 p.m. While she was coming out of the gate of the K.E.M. Hospital, the accused who was a taxi driver met her at the gate and inquired as to where she was going. The prosecutrix told the accused that she was on her way to her residence. The accused told her that he had his own taxi and he would drop her at her residence at Danda. Upon such offer, the prosecutrix got into the taxi. When the taxi came to the Linking Road Junction, the accused told her that his wife was admitted in Nanawati Hospital and he would go and see his wife in the hospital and thereafter he would drop her at her residence.

The accused then took the taxi to a small hotel representing that it was Nanawati Hospital. The accused took her inside the room of the hotel, bolted the room from inside and committed rape on her by threatening that in case of her shouting, she would be finished. Both of them came out of the hotel room and the accused dropped her home at 5.45 p.m. in his own taxi.

4. *The prosecutrix reached home bleeding profusely from her private parts. After half an hour, she became unconscious. Her mother Vimal PW-13 and her brother Eknath took her in a taxi to Bhabha Hospital. She was examined by Dr. Dilip Chaniary-PW-12 of Bhabha Hospital. After she regained consciousness at about 10.00 p.m. she narrated the incident to her mother that she was raped at about 5 p.m. and told that she was bleeding from her vagina since 5.30 p.m.*

5. PW-15, S.I. Bagal, who was attached to Bandra Police Station was intimated about the incident on telephone, PW-15, along with a Police Constable, reached Bhabha Hospital for inquiry. He contacted the prosecutrix in the ward. He also questioned her about the incident and recorded her statement. He also recorded the statements of her mother Vimal and brother Eknath. He further made inquiry about the age of the girl from the brother and mother of the prosecutrix. Thereafter, he went to the school where she studied last and collected the school leaving certificate from Khar Upper Municipal School on 11th July, 1980. PW-15 did not register any case presumably thinking that the age recorded in the school leaving certificate was more than 16 years and she was a consenting party to sex. He was of the view that there was not enough material to register a case. He also stated that he called the accused for further inquiry on 3-4 occasions but did not think it necessary to register the offence or to carry further investigations. The conduct of PW-15, S.I. Bagal has been commented upon and deprecated by both the trial Court and the High Court, which we may refer at an appropriate stage, if need be.

8. During the course of investigation, S.I. Parab recorded the statements of the witnesses including the prosecutrix and her parents and collected relevant documents. It is revealed from the documents collected by him that Pushpa's (prosecutrix) date of birth was 29th

4. *Vishnu v State of Maharashtra*, AIR 2006 SC 508 : 2005 AIR SCW 6149 (SC) : 2006 Cr LJ 303.

November, 1964 and she was below 16 years of age at the time of commission of offence on 10-7-1980. The accused was arrested on 3rd November, 1980 and during interrogation, the accused took them to the Marwadi Hotel at Juhu where the prosecutrix was taken by him. The panchnama was drawn *vide* Exh. 7. After close of the investigation, a *prima facie* case was established and a charge-sheet against the accused under sections 366/376, IPC and section 57 of the Bombay Children Act was filed before the Additional Chief Metropolitan Magistrate, 9th Court, Bandra, Bombay. Thereafter, the case was committed to Sessions. Before the Sessions Court, the prosecution examined as many as 14 witnesses and led documentary evidence with regard to the establishment of the age of the prosecutrix and after the conclusion of the trial, the accused was convicted and sentenced as stated above.

9. We have heard Mr. U.U. Lalit. learned Senior Counsel for the appellant and Mr. Sushil Karanjkar, learned counsel for the respondent at length.

10. Before us the learned Senior Counsel for the appellant strenuously urged that there are two dates of birth of the prosecutrix, one – 29-11-1964 (recorded in the Date of Birth register of the Bombay Greater Municipal Corporation and register of Kashibai Hospital, Santa Cruz, Bombay, where Pushpa was born): and second – 29-6-1963 (the date of birth recorded in the school leaving certificate of Khar Upper Municipal School) which have created a doubt and are capable of two opinions — One in favour of the accused and the other against the accused; the one in favour of the accused should be accepted and the accused be acquitted by giving him the benefit of doubt. He further contended that since the sexual intercourse is consensual, therefore, unless it is established that the prosecutrix is below the age of 16 years, the accused is not liable to be punished in view of the definition of 'rape' under section 375 of IPC namely, clause sixthly. This submission deserves outright rejection.

11. The question whether the date of birth of the prosecutirx is 29th November, 1964 or 29th June, 1963 is no more in controversy.

12. The date of birth of the prosecutrix, as of 29-11-1964, has been recorded concurrently by both the trial court and the High Court on consideration of the evidence of PW-1, Pandurang, father of the prosecutrix and PW-13, Vimal, mother of the prosecutrix, corroborated by the age of the prosecutrix recorded in the date of birth register of Greater Bombay Municipal Corporation and the register of Kashibai Hospital, Santa Cruz, where the prosecutrix was born. The evidence of PW-1 and PW-13, father and mother of the prosecutrix supported by contemporaneous documents/registers produced by the prosecution like date of birth register in Bombay Municipal and the date of birth register in the Hospital where the prosecutrix was born and the evidence of the doctor clearly establish that the prosecutrix was born on 29-11-1964. Therefore, this question need not detain us any longer in view of the observations of this Court in the case of *Bharwada Bhoginbhai Hirjibhai v State of Gujarat*, AIR 1983 SC 753 : 1983 Cr LJ 1096 : 1983 3 SCC 217, this Court held at para 5 page SC 755:

> A concurrent finding of fact cannot be reopened in an appeal by special leave unless it is established: (1) that the finding is based on no evidence, or (2) that the finding is perverse, it being such as no reasonable person could have arrived at even if the evidence was taken at its face value, or (3) the finding is based and built on inadmissible evidence, which evidence, if excluded from vision, would negate the prosecution case or substantially discredit or impair it, or (4) some vital piece of evidence which would tilt the balance in favour of the convict has been overlooked disregarded or wrongly discarded.

13. The present is not a case of such a nature which would warrant our interference. That apart, what was recorded by the High Court is worthy to be noted. In paragraph 13, the High Court has noted as under:

> *At the outset, it is required to be noted that the finding recorded by the trial court that Pushpa was less than 16 years of age on the date of the commission of the offence is not at all challenged by Mr. Samant.*

Noticing the aforesaid observation of the High Court, this Court while issuing notice on 19-7-1999, noted as under:

> *Learned counsel for the petitioner contends that even though the counsel for the petitioner in the High Court did not challenge the age shown in the birth register, there are materials*

for indicating that the said date cannot be accepted as a correct one. He invited our attention to the date of birth shown in the School Leaving Certificate. According to the counsel if that is to be given credence the prosecutrix would be far above the age of 16 years on the date of occurrence. Question of consent will very much depend upon the exact date of birth of the prosecutrix. In the light of this we feel it necessary to examine the record.

14. It is because of that observation we allowed the learned counsel for the appellant to make submissions on the question of date of birth.

15. We have also perused the entire records.

16. The school certificate which has been relied upon by the accused is marked Exh. 37, the translated copy of which reads:

"Khar-Danda Higher Secondary Marathi School

Birth date of ex-student of said school – Pushpa Pandurang Satrange as per school register is twenty-ninth June, Nineteen Sixty Three – 29-6-1963.

Submitted dt 11-7-1980.

Sd/-

For Principal

Khar Danda Higher Secondary Marathi School.

17. *On a bare perusal of the certificate, it is noticed that it is not an authenticated copy and no one has been examined to prove the age of the prosecutrix recorded in the school certificate.*

18. *PW-1, Pandurang is the father of the prosecutrix. He has stated that his daughter Pushpa (prosecutrix) was born on 29-11-1964. He has also stated that Pushpa was born at Kashibai Hospital Santa Cruz, Bombay. This witness was subjected to lengthy cross-examination but his statement that the prosecutrix was born on 29-11-1964 remained unimpeached. In fact, in the cross-examination, this witness clarified that the date of birth given in the school was incorrect and he further clarified that the correct date of birth of Pushpa is 29-11-1964. It is a common knowledge that very often parents furnish incorrect date of birth to the school authorities to make up the age in order to secure admission for their children. Therefore, we do not see any infirmity in the statement of the witness, who is the father of the prosecutrix, stating that the prosecutrix was born on 29-11-1964.*

19. ***PW-13, Vimal is the mother of the prosecutrix. She has also stated that her daughter, Pushpa (prosecutrix) was born in Kashibai Hospital, Santa Cruz, Bombay on 29-11-1964. To prove this, the prosecution has examined Dr. Shashikant Awasare, who is one of the proprietors of Dr. Kashibai Nursing Home, Santa Cruz (West), Mumbai. He has produced the registers for the year 1964. He has also produced the entry at Sr. No. 293, Exh. 18. The entry shows that Vimal – PW-13 gave birth to a female child on 29th November, 1964. The prosecution has also produced a Certificate of Birth Registry of Municipal Corporation of Greater Bombay which shows the registration of a female child of Pandurang – PW-1 and Vimal – PW-13 and the date of birth is shown as 29-11-1964. To prove this the prosecution has produced on record the Birth Register Book No. 24 of Municipal Corporation of Greater Bombay showing entries from 4th November, 1964 to 5th February, 1965. The entry at Sr. No. 542, dated 16th January, 1965 is in respect of the birth of the female child to Vimal and the birth date is shown as 29th November, 1964. These two unimpeachable documents clearly corroborate the statements of PW-1 and PW-13 in all material particulars that the prosecutrix was born on 29th November, 1964. Men may lie but the documents do not. These two unimpeachable documents clearly establish the fact that PW-4, Pushpa was born on 29th November, 1964. Therefore, she was below 16 years of age on 10-7-1980 and her consent, if any, is immaterial under clause Sixthly of the definition of "rape" under section 375, IPC.***

20. Mr. Lalit referred us to the evidence of Dr. Bhimrao – PW-10. Dr. Bhimrao was the Medical Officer, Police Hospital, Nagpada, before whom the prosecutrix was produced on 3-11-1980 for medical examination. According to him, she had fourteen teeth (7/7) in upper jaw and thirteen teeth in lower jaw. The doctor opined, among others, that her

hymen showed old healed tears at 3-9 O'clock position. For the determination of the age of the prosecutrix, PW-10. Dr. Bhimrao has stated as under:

> *I X-rayed for ossification test. I took her X-rays of wrist, elbows and shoulder joint. Elbow joint is united which unite at the age of 13/14 years. The wrist joint is united which unites at the age of 16/17 years. The shoulder joint is united which unites at the age of 18 years. From physical findings and ossification test and secondary sex characteristics I am of the opinion that the age of the girl Pushpa was 18-19 years with error of margin 6 months on either side. From the finding of internal examination of external genitals I am of the opinion that the said girl was subjected to sexual intercourse. Notes of examination prepared by me. It bears my signature and also of Dr. Gawane.*

21. It is urged before us by Mr. Lalit that the determination of the age of the prosecutrix by conducting ossification test is scientifically proved and, therefore, the opinion of the doctor that the girl was of 18-19 years of age should be accepted. We are unable to accept this contention for the reasons that the expert medical evidence is not binding on the ocular evidence. The opinion of the Medical Officer is to assist the Court as he is not a witness of fact and the evidence given by the Medical Officer is really of an advisory character and not binding on the witness of fact.

22. In the case of *Madan Gopal Kakkad v Naval Dubey,* (1992) 2 SCR 921 : (1992) 3 SCC 204 : 1992 AIR SCW 1480 (1494) this Court has considered a similar question and pointed out in paragraph 34 at page SCC 221 as under:

> 34. *A medical witness called in as an expert to assist the Court is not a witness of fact and the evidence given by the Medical Officer is really of an advisory character given on the basis of symptoms found on examination. The expert witness is expected to put before the Court all materials inclusive of the data which induced him to come to the conclusion and enlighten the Court on the technical aspect of the case by explaining the terms of science so that the Court although, not an expert may form its own judgment on those materials after giving due regard to the expert's opinion because once the expert's opinion is accepted, it is not the opinion of the Medical Officer but of the Court.*

23. We are of the opinion that this contention of the counsel for the appellant will be of no assistance in the face of evidence of fact from the mouth of PW-1 father and PW-13 mother, well corroborated by the register of the date of birth of Bombay Greater Municipal Corporation and the evidence of Dr. Shashikant Awasare, who is one of the proprietors of Dr. Kashibai Nursing Home, Santa Cruz (West), Mumbai, produced by him which shows that PW-4 Pushpa was born on 29-11-1964.

24. In the case of determination of date of birth of the child, the best evidence is of the father and the mother. In the present case, the father and the mother-PW-1 and PW-13 categorically stated that PW-4 the prosecutrix was born on 29-11-1964, which is supported by the unimpeachable documents, as referred to above in all material particulars. These are the statements of facts. If the statements of facts are pitted against the so-called expert opinion of the doctor with regard to the determination of age based on ossification test scientifically conducted, the evidence of facts of the former will prevail over the expert opinion based on the basis of ossification test. Even as per the doctor's opinion in the ossification test for determination of age, the age varies. In the present case, therefore, the ossification test cannot form the basis for determination of the age of the prosecutrix on the face of witness of facts tendered by PW-1 and PW-13, supported by unimpeachable documents. Normally, the age recorded in the school certificate is considered to be the correct determination of age provided the parents furnish the correct age of the ward at the time of admission and it is authenticated. In the present case, as already noted, the parents had admitted to have given an incorrect date of birth of their daughter, presumably with a view to make up the age to secure admission in the school. Apart from this, as noticed earlier, the school certificate collected by PW-15 S. I. Bagal was not an authenticated document. Nobody was produced to prove the date of birth recorded in the school certificate. The date of birth recorded in the school certificate as 29-6-1963 is, therefore, belied by the unimpeachable evidence of PWs-1 & 13 and contemporaneous documents like date of birth register of Greater Bombay Municipal Corporation and the register of the Nursing Home where the prosecutrix was born and proved by Dr. Shashikant Awasare, as noted above.

CHAPTER 25

COMPUTERS

SYNOPSIS

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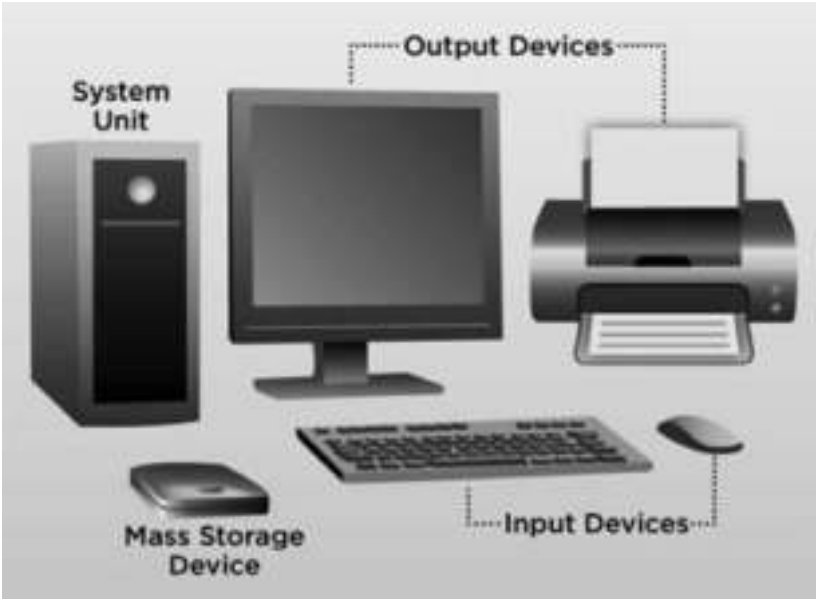

Fig. 25.1

25.1 IMPORTANCE

Computers are being used extensively not only in science and industry but also in household work and for entertainment. Today one cannot even think of education, communications, space research, defence weaponry, travel and transport, publishing industry without computers. In short, computers have become indispensable in all our lifestyles.

25.1.1 Police Work

Computers have helped the police department in a big way to improve its functioning on all grounds. They are used extensively in all aspects of their functioning. The major applications are:

- *Modus Operandi* records
- Fingerprint records
- Weapon possession records
- Vehicle registration records
- Traffic Control
- Lost or stolen vehicles records
- Absconders' records
- Missing Persons' records
- National and International Communications including e-mail, Internet and Fax facilities
- Equipment and Resources Information
- Manpower Availability and Deployment
- Service records of the personnel of the force
- Crime Cases records
- Court Cases records
- Record of Suspects
- Record of Drug Users, Peddlers
- Digital Photography
- Image Enhancement
- Police Interrogations
- Movement of the criminals through the call record in their mobile phones
- Recent contacts of the criminal with other criminals from cell phones
- Frequency of contacts with various individuals
- Miscellaneous information contained in computers and mobile phones.

Computers are also being used extensively by the police assisting organisations and other wings of the criminal justice system for many reasons, including the Photofit reconstruction of facial features, psycho-linguistic analysis, and brain printing.

25.1.2 Forensic Science

In Forensic Science Institutions, computers are being used in all aspects of their work. In addition to the usual office work, including manpower management, they are being used in the following:

25.1.2.1 Crime scene

Digital Photography is used to record the crime scenes now. The computers store these digital photographs. Computers are also used to store other photographic data (mug photographs). The computers provide a convenient mode to circulate photographs and other data to concerned organisations or units, or their printouts can be prepared and circulated.

Currently, computers are being used to prepare 3D sketches of the crime scene using special software.

25.1.2.2 Fingerprints

Searches and comparisons of fingerprints are no longer manual. Computers are carrying out the work with high efficiency. They are also processing and enhancing the readability of faded fingerprints. National Crime Record Bureau (NCRB), Ministry of Home Affairs, Government of India, has developed a system termed as FACTS — an acronym for Fingerprints Analysis and Criminal Tracing System. The system uses a scanner to convert the fingerprint or its image into digital data, which is stored in a computer. When a new crime fingerprint is to be identified, it is digitized (converted into digital data) and fed into the computer. On demand, the computer carries out the comparison of the data with similar data in the computer. If the computer hits a match, it reveals the details of the person from whom it has come. The whole work is done at high speed.

25.1.2.3 Tracks and Trails

Computer technology has proved a boon for processing track marks evidence:

- Processing of holograms
- Enhancement of indistinct images
- Comparison of track evidence
- Evaluating gait patterns in CCTV footage to identify the target person

25.1.2.4 Forensic Ballistics

Ballistics has adopted computer technology in its functioning mainly for the following evaluations:

- Data relating to Ballistics tables have also been computerised. The factors like air resistance, structural, and compositional features, which introduce variations are better managed with computerised computations.
- Automatic comparison of firearm marks (Striations and static marks) on the fired ammunition is being done through instrument controlled by computers.

  USA is using a system called NIBIN (National Integrated Ballistics Information Network) which, like fingerprint automation, keep records of the firearm marks. The system compares the marks on new fired crime projectiles and cartridge cases with the corresponding stored data and identifies the weapon used. The system has great utility where the same weapon is used in many crimes. The system has distinct advantage where the comparisons of bullets and cartridge cases are carried out at

different and distant places. The images are transferred *via* internet has made it possible to do so. There are other automatic comparison systems also.

- Data on firearms, ammunition, and pellets' spread of various shotguns at various ranges are maintained routinely by most of the laboratories in the computers for day-to-day consultations.

25.1.2.5 Disputed Documents

The computers are becoming indispensable in the evaluation of disputed documents:

- The comparison of signatures is being done *via* digitalized images of signatures. This technique can reduce bank frauds considerably.
- Typescript examination has been facilitated considerably by computers. They help to find out additions, alterations, and obliterations by evaluating the spacing patterns, linear and vertical alignment variations and defects.
- Faded and mutilated writings are better evaluated by image enhancement technology.
- Enlarged prints of very high quality permit better evaluations and comparisons of the handwritings, signatures, initials, additions and other alterations.
- Comparison of seals, stamps, logos, insignias is facilitated by computers in conjunction with scanners
- Presentation of evidence of handwriting and signatures has been improved tremendously. Segmentation, enlargements, and increasing contrast/brightness have improved the presentation.

In a recent case, the signature of the victim were partly on a bank loan form and partly on a stamps paper stuck on the form, the signature part on the stamp paper was barely visible. The victim did admit that he had signed the form but not the stamp paper the deputed signature was put under a scanner and the colour of the signature was gradually reduced. At one stage the true picture of the portion of the signature on stamp paper could be obtained. It was found that un-extrapolated signature part on the stamp paper was forged. (CH)

25.1.2.6 Chemical Analysis

Practically all instrument used in the analysis is computer controlled. The computer controlled instruments are now doing the interpretation of instrumental analyses of poisons/drugs and other chemicals increasingly. They contain the software, which carries the library of the analytical data of the standard sample materials analysed by the instruments. Software, thus, on command, compares this data with the data generated from the clue material automatically and the result is displayed on the monitor. The instruments also provide printouts of the findings in the form of graphic traces and data.

The instruments and technique contain inbuilt computer evaluations and interpretation system. The following are, however, the ones, which have made the work of the Forensic analysis easy, reliable and efficient. They not only reveal the identity but the quantity also.

1. Atomic Absorption Spectrophotometer
2. Neutron Activation Analysis
3. Spectrographs
4. Microprobe
5. Scanning Electron Microscope, with E.D.X. system
6. GLC, HPLC, TLC, HPTLC
7. GS-MS,

8. UV, IR, NIR, FTIR, Spectrophotometers
9. Microscopes-Quantimat
10. Comparison Microscope

The computerised instruments are being utilised for evaluations of all sorts of clue materials including:

1. Poisons
2. **Narcotics** and psychotropic substances
3. **Glass;** Data Bank on their properties like Refractive Indices, and Densities are available.
4. **Paints;** they are being evaluated for 16 parameters through computer software specially created for the purpose.
5. **Microtraces;** dust, dirt, soil, plant residues, animal residues.
6. **Liquors;** for composition, adulteration, identification, quantitation of the components.
7. **Drunkenness;** it is an increasing menace. Computerised instruments like computerised breath analysers indicate the extent of drunkenness among drunken drivers and provide printouts at the spot itself.
8. **Computerised arson detectors;** confirm the arson nature of the fire at the spot itself.
9. Computerised GS-MS identify initiators, accelerants, promoters in arson cases.
10. **Explosive Detectors;** they are computerised instruments which detect explosives and explosion products through their vapours. Comparison of data from various explosion sites may inter-link the serial explosions.

25.1.2.7 Biological Analysis

Computers are being utilised in the evaluation of biological evidence of all types. They are efficient in processing and interpreting biological evidence. Computers have made themselves indispensable in the following evaluations:

1) DNA Profiling

DNA profiling is the biggest breakthrough in Forensic Science of all times in forensic identifications. It has come almost a hundred years after the discovery of fingerprints for personal identifications. Computers have helped to evaluate and compare the fragments of the DNA molecules. The comparison of the profile of a suspect with the profile of the evidentiary material may identify or eliminate the suspect as the criminal as no other evidence can do.

All body fluids and materials, skin, flesh; even bone or hair can be used to develop DNA profiles. Some countries, like the USA and UK, have organised a DNA database of all the convicts to identify recidivists.

2) Anthropological Evidence

A lot of data relating to bones and skeletal remains, including that on dentures, skulls has been gathered and stored in computers. The data is being utilised to identify and ascertain various aspects of the deceased to whom the remains could belong:

1) Age, sex, height and built of the subject
2) Cause of death
3) Time of death
4) Deformity, injury or any bone disease
5) Facial Reconstruction
6) Skull Superimposition

Due to the availability of extensive data the interpretation are quite accurate.

3) Facial Reconstruction

Facial reconstruction is an important aspect and aid in the identification of the deceased person from the skull. A lot of data has been generated about the thickness of skin and flesh at various sites of the face. The sculpturing material is plastered to various thicknesses in accordance with age and sex of the subject, on the skull itself or on its sturdy cast. With appropriate skin tint, eyes, and ears a life-like face is created.

Computers have, more or less, dispensed with the above reconstruction technique. The computer is fed with the skull structural data, and other facial feature data and cranial structure are created in three dimensions on the monitor with special software. The facial features in flesh-like shades are created and contoured according to depth and thickness data already available with the computer. The facial figure thus obtained is digitized, and the obtained data are compared with similar data generated with that of the suspected subject. The computerised reconstruction has not only speeded the process but it has increased the accuracy manifolds. It has also greater maneuverability.

4) Skull Superimposition

Skull superimposition on the photograph of a suspected subject, for identification purposes, have been in use for decades now — since the Ruxton case in which the technique helped to establish the identity of the victims for the first time in the forties of the last century. Computers have speeded up the process tremendously. They have improved the accuracy also, many times.

25.1.2.8 Medico-Legal Work

Doctors are not only utilising computers in the treatment of the patients but medico-legal experts are also using computers in solving complex medico-legal problems:

a. Subcutaneous Injuries

In medico-legal cases, it is usually difficult to evaluate internal injuries, especially when the injured is still alive. Computerised scanning devices evaluate the nature and extent of damage, to determine whether the injury is grievous or otherwise. In fatal cases, it helps to ascertain their contribution toward the cause of death.

b. Post-mortem Examination

In mass disasters, post-mortems are conducted mainly to identify the victims. The identification data of each individual is collected and serially stored in the computer. This data of the suspected deceased persons is collected from the available sources (relatives, acquaintances, family doctor). The data from the two sources are then compared to identify the mutilated deceased. The relevant data collected is:

- Dentures, broken, extracted or repaired teeth, and their alignment defects, which provide excellent evidence.
- Previous bone injuries and their X-rays and deformities
- Scars, tattoo marks, and birth marks, if available
- Anthropometric measurements for developing portrait Parle
- Description of wearing apparel

Similar descriptions and data are also kept in cases of unknown and unclaimed dead bodies. Computerised data is also fed into the computers and relayed over the network or internet. They have been identified and their relatives located frequently through this mode.

25.1.2.9 Medico-legal Research

In medico-legal work one of the trickiest problems, which has defied an accurate solution, is the finding of the time of death. This is because it involves many variables:

- Health of the subject
- Cause of death
- Environmental conditions like wind, temperature, humidity
- Existence of special circumstances like addiction
- Up-keep of the body (exposure to elements, buried under snow, water, sand, earth)

Computers are now being utilised to record and process the data of these variables. The extensive and accurate processing of the variables, it is hoped, would give more accurate results.

25.2 COMPUTERS AND LAW

Computers are being used increasingly by lawyers and judges, in their day-to-day work to store, classify and locate:

- Correct laws.
- Correct case law.
- Correct sources of scientific help.
- Precedence and conventions
- Law library in Internet, computers pen drives,

These huge libraries are now giving way to computers, pen drives, CDs and floppies. On the flick of the mouse or on pressing of a button the information on the required topic, whether it is on law or on expert evidence, is before the judge or the lawyer, whoever has requisitioned the same. Again, if it is so required, a printout of the information can be obtained.

Outstanding luminaries in law even go beyond. They record the summaries of the evidence on day-to-day basis. They anticipate and note the possible line of defence or of prosecution and collect appropriate material information to rebut the same. The simpler uses of computer are to:

- Keep inventory of the cases on day-to-day basis.
- Prepare brief on the case.
- Prepare a daily roaster.
- Study and collect case law *via* internet.
- Retrieve precedents of similar cases.

The lawyers and the judges are somewhat slow in picking up the technology but the advantages are so many and so impressive that no lawyer worth the fight or an enlightened judge can ignore the onslaught of the computers.

25.3 NATURE

The computer is a device to store, preserve, process, and to reproduce data on demand in the desired form. It is a complex instrument with still more complex components. It started with computing figures and digits. Now all types of data, digits, letters, pictures, graphics, voice, action can be preserved, processed and reproduced or created at unbelievable speeds, with uncanny accuracy. Its complexity involves high technology. Yet the instrument is so streamlined that with practice one can use the instrument usefully without knowing the technicalities involved. As this discussion is meant for non-technical potential users, the technical details have been omitted. The computer has essentially the following components:

1. Central Processing Unit (CPU).
2. Input, throughput and output devices.

25.3.1 CPU

Central processing unit is the main part of the computer. It contains the memory, storage of information and the system and application software. The nature, extent and capacity of the computer determine the configuration of the computer. Special software for specific purposes is also used. Microprocessors have drastically reduced the bulk of computers.

The CPU (also known as processor), of a computer, is its brain. It is a single chip and contains a control unit and the Arithmetic Logic Unit (ALU).

The processor is responsible for interpreting every code it receives from the other computer components and making it usable in the operating system. The processor's speed determines the overall speed of your computer.

25.3.2 Motherboard

The motherboard is that part of a computer that connects all of the other computer parts together. It is a printed circuit board and includes the CPU and memory. It includes expansion options for high-end graphic displays and additional devices. Motherboard specifications are designed around which CPU the computer uses.

25.3.3 Hard disk

The hard disk is also known as hard drive. It is the information storage device. It stores all sort of information in the computer; whether it is text, picture or other graphics. It has a large capacity, which is measured in MB/GB/TB.

The hard disk is a set of disk platters, which are located inside the computer. It is a fixed component and cannot be separated.

25.3.4 Random Access Memory (RAM)

RAM operates an instant memory to operate computers. It is always in use as a temporary location to carry out the instruction given to the computer. There are many types of RAMs, with varying speeds.

25.3.5 Input Devices

Input devices are a keyboard, a microphone (sound input), scanners (for graphic inputs) and network and Internet connection. The keyboard is the main input device. Downloading from the Internet is becoming an important input (as well as an output device). Likewise, scanner is an optional input device. But its utility is increasing every day.

25.3.6 Output Devices

Output devices vary. Most important and perhaps indispensable is the monitor. The printer is an optional but important device for output purposes.

Network and Internet modem connects the computer with the outside computer world, which is used both for input and output purposes. The network connects the computer *via* cables and microwave towers. It may be:

1. Local Area Network (LAN)
2. Wide Area Network (WAN)

   Some organisations use the two systems for internal connectivity, for secrecy and security of the information.
3. Internet

Internet to start with was connectivity among a group of computers. Now it is a global network of computers and provides worldwide connectivity. There are a number of organisations, which provide connectivity to other computers through their network. They use microwave towers or satellites for the inter-connection. The network of networks is the Internet.

Internet connectivity may be termed a technology. It has no tangible site. The intangible Internet activity site is called cyber space. The Internet has been compared to the spider web, but the Internet covers the whole world and known as World Wide Web (WWW). It connects any two computers, using the Internet, anywhere in the world. The connecting media does not involve physical entities in the usual sense.

25.4 COMPUTER WORK

Computers handle data of all sorts. They carry out a number of tasks relating to data:

1. Compute
2. Store
3. Arrange, rearrange
4. Compare
5. Transfer to other files
6. Print printouts (with printers)
7. Transmit or receive (FAX)
8. Provide E-mail facilities
9. Provide wealth of data information available on the Internet through Internet modem
10. Provide online business, education and entertainment facilities

The tasks are performed by computers with speed and accuracy, which make them indispensable in all organisations and even in homes.

CHAPTER 26

COMPUTER FORENSICS
(Computer/Cyber Crimes)

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Fig. 26.1

Computer forensics is a branch of digital forensic science. It handles crime evidence legally found on the computer and related digital storage devices, including hard disk, files, and concerned software. The purpose of these investigations is to study and analyze the data forensically to find if there is any illegality in these digital files and contents. The findings are submitted/furnished in the form of a report.

Computer Forensics is synonymous with computer crime, cyber crimes, e-crimes, net crime, and electronic crime.

26.1 GENERAL

The advent of computers has completely revolutionised the functioning of science and technology institutions, the working of the offices, including that of the courts and homes. The unthinkable speed, un-imaginable accuracy, and elimination of drudgery of work and cost-effectiveness have made the computers and like devices indispensable to all concerned. They have made possible certain scientific developments; for example, space travel, Ballistic missiles, which were unthinkable otherwise. However, it is not a one-sided blessing. The computers have also facilitated crime in a big way: number wise, volume-wise and, particularly, losses-wise. Thus, they have created a big headache to the public in general and the law-keepers in particular. The criminal has not been slow to exploit the potential of the computers.

Computer crimes are known by many different names, including cybercrime, net crime, e-crime, or electronic crime. They all involve computers and networks in most of the crimes. The computer crimes include identity thefts, hacking, spams, and financial frauds. The criminal is also using computer and Internet in most of the traditional crimes, such as theft, blackmail, pornography, forgery, embezzlements, fraud, and money laundering, which today are also conducted on the Internet on much vaster scales.

26.1.1 Definition

Computer crimes are illegal activities involving computer systems. It is an act using computers, the Internet, Internet devices, and Internet services to defraud people, companies, or government agencies for money, revenue, or Internet access. Computer crime criminals are well-versed in computer technology and use them in their nefarious activities. He illegally browses, or steals/

corrupt/destroy the person's (or group of persons') data. Often the act corrupts the computer or the data files.

26.1.2 Computer crimes

There are numerous types of computer crimes; and the number and variety in increasing with the passage of time. The important illegal computer activities include:

1. **Child pornography;** making or distributing child pornography.
2. **Cyber bully and Cyber stalkers;** stalkers and bullies follow a person on line and harass him/her.
3. **Cyber terrorism;** threatening, hacking, and blackmailing messages.
4. **Denial of Service;** some criminals overload computer system to make it useless for normal functioning.
5. **Espionage;** spies spy on a person's/organisations/installations/business houses.
6. **Identity theft;** Identity thieves misuse the credit card/his name/fame for personal gains.
7. **Inducting** Malware (viruses and spyware); to make the computer non-functional.
8 **Intellectual property theft;** stealing intellectual/scientific discovery data and using it to make money/name /fame.
9. **Phishing;** It is stealing personal data of a person, for misuse.
10. **Salami;** it is slicing money in small amounts, from each of many online transactions through command to the computer.
11. **Scams;** they are frauds to swindle people/organisations/governments.
12. **Spamming;** sending unsolicited e-mail to numerous persons to waste their computer space.
13. **Spoofing;** it is impersonation; presenting self as someone else (the targeted victim)
14. **Unauthorized access;** it is entering computer systems, without authority.
15. **Wiretapping;** It is connecting a device to an ATM/phone line to record information (data) and to misuse the same.
16. **Induction of viruses**

More recently, commercial organisations have used computer forensics to their benefit to fight against a variety of computer crimes including:

1. Bank Fraud
2. Investigations Intellectual Property theft
3. Bankruptcy investigations
4. Forgeries
5. Inappropriate email and Internet use in the work place
6. Industrial espionage
7. Regulatory compliance

26.1.3 Computer and crime

A computer forensics a computer can be:

1. **An object of the crime**

A computer is the object of many crime crimes including:

- It is stolen.
- It is destroyed
- It is corrupted

2. **An instrument of crime**

A computer is used to commit many types of crime including the following prominent ones:

- Smuggling
- Drug trafficking
- Money laundering
- Many types of frauds
- Conspiracies
- Crime planning by criminal gangs
- The list goes on.

3. **A repository of incriminating evidence**

The computers are an ocean of information. The criminal's computer often carries useful information, including the following:

- The names of the members of the gang/associates.
- The information about various crimes committed.
- The names/addresses of contact persons.
- The names and addresses of the persons with whom they carry out their business (drug traffickers smugglers/human traffickers/bootleggers,-money launderers).
- The names of the victims.

26.1.4 Computer Crimes: Motives

Computer crimes are committed for varied motives:

1. **Gains;** bank and frauds, counterfeiting of currency, and money laundering are potent sources of money and computer facilitates the crimes.
2. **Counterfeiting;** of documents, bonds, certificates, shares, and duplication of signatures.
3. Spying.
4. Revenge.
5. Theft of intellectual property.
6. Mischief.
7. Personal Vendetta.
8. Blackmail.
9. Ego.
10. Mental aberrations.
11. Sexual gratification.

12. Espionage; steal vital secret data or information.
13. Destroy, damage, or change vital computerised control systems at various installations.

In view of the above, computer crimes need special attention of all concerned with the criminal justice system or the healthy contribution of the computer forensics.

The criminal has exploited the crime potential of the computer. The investigator must exploit the computer Forensics to detect/investigate/prevent computer crimes.

Computer crimes are of a different species. The losses are colossal. Further, like the universe, they are expanding in all directions with the lightning speed. The investigations are extremely difficult and often the criminal goes unpunished. There is a continued explosion of computer crimes number-wise and in dimensions. The IO, the forensic scientist, the victim, the government, and the public must join hands to curb the menace; otherwise the ***Ghotalas***[1] in thousands/lakhs of crores of rupees not only will continue, but will expand exponentially.

26.1.5 Cyber crimes

Cybercrimes involve the Internet, which is the main distinguishing feature of these crimes. They, like other computer crimes, are often high profile crimes against nations, corporations or individuals with criminal intent for personal gains at the cost of the victim who may suffer mentally, physically or financially. The cybercriminals employ the latest communication mode: SMS, MMS, Facebook, chat rooms, e-mails, Electronic Fund Transfer. Worst still, the hacking activities and information piracies by individuals and nation-states have threatened the security and financial health of other nations/organisation/business houses and individuals.

Pornography, child grooming and copyright infringements are other crimes of top concerns of the public and of the law keepers. Spams are a serious nuisance, torturing computer users.

26.1.6 Characteristics

Computer crimes have the following characteristic features:

26.1.6.1 Intangible Evidence

The evidence relating to computer crime is intangible. The evidence may have been erased, damaged or secreted. The correct facts may not come to light. It may not come to notice even for a long time. Even if it comes to notice, the evidence connecting the criminal with the crime is often not available, or, it is insufficient to permit prosecution or conviction of the culprit.

26.1.6.2 Substantial Losses

The incidence of computer crime, in India, is comparatively low. The main reasons being that the computerisation is yet in its developing stage. Besides the crime is high tech crime. Reserve Bank of India has reported only one crime (up to 1998) in which the overdraft limit was raised for the borrower. This is in spite of the fact that other bank frauds, value-wise and volume-wise, have increased substantially. However, it is a fast-growing crime. In about one decade, the official figures of computer crime have gone sky-high. The IT Minister, in a reply to the Parliament, has given the official figures and the measures thereof taken by that the Central Government of India are:

1. We have their numerous visitations, the latest being (Feb-March, 2018) of Vinod Modi and his associates.

1. According to data maintained by National Crime Records Bureau (NCRB), a total of 217, 288, 420 and 966 cyber crime cases were registered under the Information Technology Act, 2000, during 2007, 2008, 2009 and 2010 respectively.
2. The nature of cyber crime recorded by NCRB included tampering computer documents, hacking, obscene publication/transmission in electronic media, unauthorised access/attempt to access the protected computer system, breach of privacy/confidentiality and digital signature related crimes.
3. A total of 90, 119, 252 and 219 Government websites as reported and tracked by ***CERT-In*** (Indian Computer Emergency Response Team) were defaced by various hacker groups in 2008, 2009, 2010 and January-October 2011 respectively.
4. 219 government websites were defaced by various hacker groups between January to October, 2011.
5. The IT (Amendment) Act, 2008 has been enforced on 27 October 2009 and provides a legal framework to address the issues connected with security breaches of IT infrastructure.
6. The Indian Computer Emergency Response Team (CERT-In) issues alerts, advisories and guidelines regarding cyber security threats and measures to be taken to prevent cyber incidents and enhance the security of IT systems.

The losses to these crimes have not been given in the reply.

The losses in the USA, however, are indicators of the shape of things to come. The losses in term of millions of dollars for various types of frauds are:

- Financial Frauds = > 24
- Software Piracy = > 21
- Sabotage through logic bomb = > 7
- Unauthorised Access (Penetration) = > 8

26.1.6.3 Prevalent Climate

The prevailing working climate in the society facilitates or inhibits computer crimes. The elements of the climate are:

- Checks and controls
- Financial and societal stresses
- Risk standards
- Ethical standards
- Existing laws
- Identification mode of the con artistic
- Prevailing preventive strategy evolved to such crimes
- Efficient or inefficient investigative agencies

Unfortunately, the climate in India is highly conducive to computer frauds. The moral values have gone so much down the drain that even the highest in the society cannot be trusted in financial matters. The only saving grace, so far, had been ignorance of the computer mode of frauds; that has also gone with the wind now.

26.1.7 Investigative Impediment

Computer crimes are different from the usual crime *vis-à-vis* investigations. In the majority of the cases, there are no eyewitnesses, no usual evidentiary clues, and no documentary evidence worth the name. Even the computer misused, may have only erased data, which may be beyond the comprehension of a normal investigator or even of an expert.

Computer crimes are difficult to investigate/control/prevent. The main hindrances, which the IO faces, include:

26.1.7.1 Hi-tech Crime

Computer Crimes are hi-tech crimes. Further computer technology is changing very fast. The normal investigator does not have the proper background in information technology. Special investigators (or team) have to be created to carry out the investigations. The FBI has done it. CBI should do it and create Computer Crime Investigation Cell. The cell should also have private computer specialists (organisation), honest and reliable who can provide the latest technical know-how for the purpose. With increasing computer crimes, it is becoming imperative that each law enforcement agency has such cells.

26.1.7.2 International Crime Global Ramification

Computer crime may be committed in one country. The resultant fall out may be in another country. Often there is no trail. Besides, jurisdictional problems arise. Interpol does help but it has its limitations. The usual crime scene is cyber-space. The Computer terminal may be anywhere even at Delhi or New York. The criminal need not indicate the place. And he does not. Besides, he erases the telltale marks of his handiwork. Often the only evidence he leaves of the crime is the loss to the victim.

26.1.7.3 No-Scene Crime

Computer-satellite-computer link can be anywhere. An input device need not be even a computer. A mobile cell, a notebook or laptop or debit or credit card can do the trick anywhere.

26.1.7.4 Faceless Crime

The criminal has just to drum a keyboard and drums of money are taken away, no personal exposure, no written documents, no signatures, no fingerprints, and no voice. The criminal is truly faceless.

26.1.7.5 All/No-time Crime

The commission of computer crimes is done with the lightning speed at any time of the day. It may take days, weeks, even months and years before the crime is discovered. By that time, the little evidence of the crime also vanishes completely.

26.1.7.6 Inadequate or non-existent laws on national or international level

26.1.7.7 Inadequate international co-operation

26.1.7.8 Inadequate governmental or public defence

26.1.7.9 General lack of information about their modus operandi or handling

26.2 CLASSIFICATION

Some persons have classified Computer crimes as:

1. Internet Crimes
2. Computer Frauds
3. Computer Crimes

Computer is the common factor in all the categories.

26.2.1 Internet Crimes

Internet crimes involve the Internet in their commission. The ultimate effect of the activity is on the computer or the computer user connected to the Internet. The following computer crimes are classed as Internet crimes:

1. Hacking
2. Logic and time bombs
3. E-mail bombing
4. Induction of virus or worm
5. Introduction of Trojan horse
6. Child pornography and child sexual abuse. It is assuming threatening proportions.

   The US police investigated the Wonderland Club, a secret club of those persons who were involved in child pornography, using the international network. It had membership from more than a dozen countries. The communication interchange among the members was through passwords and contents were exchanged through encryptions.

   Police investigation action ended up in about 100 arrests seizure of over 100,000 images. (CH)

   Cyber pornography promoters have adopted many novel ways to expand their nefarious trade. They are using camouflaged pornographic websites, produce pornographic magazines using computers, which are available to their client on the Internet. They can be downloaded to get soft or hard copies of the obscene and dirty images: pornographic pictures, photos, and writings.
7. Hijacking of data; from credit or debit cards
8. Diversion of destination of EFTs.
9. Piracy: art piracy, literature piracy, Entertainment material piracy, software piracy, film piracy, music piracy, piracy of published books. The losses of each piracy run into billions to the original owners.
10. Theft: identity theft, password theft, code theft, information or data theft, official secret data, development project theft, Research data theft.
11. Blocking of service
12. Intrusion (Break-in), spoofing, spams (un-solicited trash e-mails).
13. False propaganda, defamation, character assassination, false rumours.
14. Espionage, eavesdropping, conversion channel.
15. Disruption of services, financial system, air traffic control, communication system, police communication system, army secret communication system.
16. Promotion of terrorism, stalking, threatening, blackmailing
17. Promotion of organized crimes in the same way as promoting business. Its important manifestations are:

- Money laundering,
- Tax evasions,
- Betting,
- Spot-fixing
- Human trafficking, and
- Drug trade.

18. Telemarketing/online sales/investment fraud.

The Internet crimes are also known as cyber crimes, and net crimes.

26.2.2 Computer Frauds/Crimes

Computer frauds involve embezzlement or defalcations achieved by tampering with computer data, record or programme.

Computer crimes involve computers to commit all sorts of crime including: theft, forgery, and counterfeiting. The difference, if any, however, is academic only and has been ignored and the two terms "fraud" and "crime" have been used inter-changeably in the present discussion.

In this chapter, all crimes which involve computers have been discussed. They include cyber (Internet) crimes also. The major types of crimes include:

26.2.2.1 Information Piracy and Vandalism

Electronic information piracy and vandalism have a serious impact on security and privacy. It has vast personal, social, political and economic damage potential through electronic eavesdropping. This is possible through:

- Scanner
- Cables, they act as antennas
- Electromagnetic signals of computers
- Network or Internet

National security information, business information (for black mail) is the usual targets. Information worth thousands of crores of rupees is stolen every year.

26.2.2.2 Theft of Information Services

Theft of information services takes many forms, including the following:

- Mobile Phone Cloning
- Telephone cards counterfeiting
- Illegal access to telephone boards

26.2.2.3 Organised Crime

Organised crime has many facets. Prominent having vast ramifications are: Drug trafficking,

- Child pornography,
- Obscene literature/films circulation,
- Smuggling,
- Human trafficking.

Internet and computers promote them with vehemence.

26.2.2.4 Infringement of Copyrights

Infringement of copyright is one of the most serious computer crimes. Software piracy of entertainment and other programmes prevails on a large scale. In some cases, sales of pirated software are more than of the genuine soft because of the cost differences. It causes heavy losses to the copyright holder.

26.2.2.5 Theft

Theft of equipment, accessories and proprietary items is quite common. Computer as a whole or its parts may be stolen. The software may be stolen. The crime is on the increase. But this is a computer crime, which has the usual parameters of normal theft cases.

26.2.2.6 Wire Tapping

It is a high potential crime. Automated Teller Machines (ATM) are high-risk targets for bankers. Those ATMs where the cables can be approached without being discovered easily are prone to the depredation of the thief/defrauder. The necessary data of the debit or credit cards used in the ATM bank can be recorded and copied and misused through wire-tapping. The con artist steals a lot of money with this stolen data before the fraud is found.

The task involves high tech. The criminal gets hold of the telephone line connecting the ATM with the bank computer. He attaches a wireless microphone to the line and records the signals when a customer is using the ATM. After he leaves the machine, the criminal plays back the signals, tripping the machine to release cash. An accomplice, who is at the ATM, collects the money. The debit goes to the victim whose ATM card data was stolen.

> A few years ago, a telephone operator in Japan tapped an ATM wire and defrauded customers from three different banks of the considerable amount before he was caught. (CH)

26.2.2.7 Data Destruction

The data stored in a computer can be destroyed, contaminated, changed. Usually, the following techniques are used to destroy the data:

- Manual
- Virus
- Logic bomb

Manual technique is used for the immediate destruction of the data. It is equally effective for changing or contamination of the data. It is the same process by which genuine deletion or substitution is done. It is simple. Even a novice can use the technique. Usually, disgruntled employees use it. The current data, important stored data or the command software are the targets of the vandalism.

26.2.2.8 Virus

The virus is an input malicious program, a sort of secret command. Software programmed to replicate itself like a virus to either slow down or destroy the data or functioning of a computer.

26.2.2.9 Logic Bombs

A logic bomb is also a secret software program, which is introduced to destroy the data or the functioning of the computer on the command of this logic bomb. The logic bomb may be:

- Time-targeted
- Data output targeted

In the former logic bomb, the destruction of the data or command module takes place at the time fixed by the logic bomber in the secret command. In the latter, the destruction takes place when the operator processes a particular data or command module. The extent of data destruction depends upon the logic bomb command.

Only computer programmers can introduce logic bombs or viruses. An ordinary computer operator cannot do so. The logic bomber ensures that it cannot be erased easily. Usually, he hides the program within a seemingly harmless item.

> *Two employees, one being a computer specialist, employed by an organisation got dissatisfied with the organisation. They introduced two logic bombs in the system.*
>
> *The first bomb was to erase the command programme of the computer on a particular date. It did. The logic bomb consisted of only 45 lines of instruction.*
>
> *The second logic bomb was to "explode" when the computer was to be tuned to a particular program. It did.*
>
> *Fortunately, the organisation had kept hard copies of all the important data which was critical to restore the computer functioning. But the restoration work cost was over a million dollars and seven days of non-functioning of the computer.*
>
> *Both the employees were traced. They were tried, convicted and imprisoned for the bombing. (CH)*

26.2.2.10 Spy Software

Spy software is utilised to find out Passwords and other vital "entry" information to a computer system. The entry is gained through an innocent-looking item like an e-mail greeting. The message introduces the software and allows the eavesdropping.

26.2.2.11 Money Laundering

In *"Aladdin and the Lamp*" story, the wizard exchanged new lamps for old dirty black lamps. The modern computer *Aladdin* wizard facilitates change dirty black money into white shinning currencies, rupees, dollars, pounds and secreting them in some secret Swiss or other off-shore Banks, without even the bankers being aware of the same by credit cards, super smart cards or electronic fund transfers through any of the machines that accept deposits. "Hawala" like operations, which rocked the Indian political scene in the nineties, would no longer occur. The computer is becoming a big Hawala agent. It transfers with lightning speed the money to any accounts across the borders, to any part of the world, in spite of the fact that the governments may have laws to restrict foreign currency inflow or outflow. It has promoted underground or parallel banking. Political and criminal Mafia are amassing wealth abroad in secret coffers or building castles secretly and with impunity. E-commerce is also making traditional checks and counter checks redundant. Any amount of money can be dumped into an account anonymously in a country, which allows complete privacy to its banking customers.

26.2.2.12 Electronic Funds Transfer

Electronic money transactions are becoming increasingly common. Transfer of money from one bank to another, from one branch to another branch, from one account to another account; or, value for goods received paid electronically is becoming routine mode. Many modes exist:

- Electronic Fund Transfer through computer machines.
- Automatic Teller Machines (ATMs)
- Various types of cards: Credit Cards, Debit Cards, Smart Cards, Super Smart Cards, Optical Memory Cards.
- Internet

Crimes associated with these modes of transfer of money are:

- Diversion of money from rightful to the fraudulent payee.
- Credit cards are copied and data misused.
- Credit cards are stolen.
- Unauthorised persons use lost credit cards.
- White cards are used in place of originals.
- Wires are tapped and necessary data were stolen to operate ATMs account.
- Withdrawals and deposits are manipulated to others accounts
- Telemarketing money is transferred from the victims' accounts without providing the promised goods worth the money.

In one computer operation a dishonest computer operator by instructing the computer got 1% of the interest, from all the saving fund accounts transferred to his account (Salami Transaction). (CH)

26.2.2.13 Electronic Personation

In e-commerce individuals, their writings, signatures, voice, do not figure. It is only through Passwords that the identity of an individual is established. Thus, stolen Passwords are working havoc. Illegal money transfer, diversion, collection and expending are increasing. The anonymity of electronic personation is causing extensive damage. Better electronic identities, through Forensic Biometrics, promise better personation prevention.

26.2.2.14 Hacking

Hackers are intruders, intruding into the computer facilities of other persons or organisations unauthorisedly. The *modus operandi* is simple. They steal passwords and enter into the security system of a computer system. They access the classified information and use the same for:

1. Mischief
2. Gains
3. Destroying data
4. Utilise the paid time on their Internet.
5. Manipulate debit/credit accounts or limits.

Usual hackers are:

1. Students
2. Information technology enthusiast
3. Egoist
4. Zealots of fringe organisations
5. Spies and agents of other governments or competitors

Hackers, like those mentioned above (especially 5), can certainly cause a lot of damage, inconvenience and disturbance in the functioning of the system.

26.2.2.15 Crackers

In recent times, the art or craft of cracking computer has reached a high level. The cracking is achieved through:

1. **Trojan Horse, t**he con artist creates and sends a malicious programme through WWW. It has secret software, to secure entry into the computer system. The computer embraces the programme and thus provides the entry to the system to the hacker.
2. **Password Sniffing:** the cracker taps the wire to get the access password.
3. **Dishonest Computer Staff:** the person, who repairs/services computer, can gain entry comparatively easily. The cracker bribes the operator to gain entry into the system.
4. **Bypassing**: the computer is entered by bypassing the password.
5. **Piggybacking:** the entry is gained by attaching the computer to the connections of the authorised user into the computer system of the target computer and lifting the entry code.

26.2.2.16 Software Piracy

Software piracy is a serious crime. In the USA, copyright holders lose 15 billions of dollars due to this crime every year and the amount is increasing every year. The pirated software cost only the films and disks. Consequently, the pirated software is dirt cheap as compared to non-pirated stuff. Thus, software piracy is a roaring business everywhere.

Software piracy is an expanding crime. The "crime industry" has unlimited scope for software piracy. However, some anti-piracy special software is being developed to meet the menace.

26.2.2.17 Miscellaneous

The variety of computer crimes is increasing rapidly. Other fairly well known computer crimes include the following:

1. Dissemination of offensive (anti-individual, anti-group, anti-religion, anti-ethnic group) materials like pornographic images, Caricatures of individuals showing in bad light, exposing black deeds
2. Phishing; it is an attempt to obtain sensitive information such as user's name, credit card details for malicious purposes. The con artist poses as an honest individual/ business man.
3. **Cyber squatting;** it is registering, trafficking in or using an Internet domain name with bad faith to profit from the goodwill of the trade mark belonging to someone else.
4. **Virus: i**t is a type of malicious software programme (malware), that when executed, replaces itself by modifying other computer programme and inserting its own code.
5. **Botnet;** it is a group of computers connected in a coordinated manner for malicious purposes. It is used to transmit malware, spam or attack other computers.
6. Distribution of offensive literature or other material.
7. Sales and investment fraud.
8. Illegal interception of telecommunications.
9. Stealing telecommunications services and telecommunications piracy.
10. Fake profiles on facebook.
11. E-mail account hacking and email scams.

12. Music piracy.
13. Electronic vandalism, terrorism and extortion.
14. Vishing.
15. Telemarketing fraud.

The list goes on. There is no end to the ingenuity of the computer con artist. He is offering new fare every day. We should check the menu carefully so that it is not too costly and we do not have to pay a heavy price for his ingenuity.

26.3 COMPUTER CRIMINALS

Who are computer criminals?

26.3.1 Employees

Information technology is highly technical. Those who are to use the technology must not only know how to handle it, but they must also know their pitfalls and evasions. Unfortunately, the management-employee relationship, based upon trust, no longer prevails. Hence, checks and balances must form an essential part of the system.

Disgruntled employees, ex-employees, temporary employees who are associated with computers often succumb to the goddess of the quick buck. Besides, negligent and highly obliging employees also contribute heavily toward computer crimes. They fall prey to the charm of the con artist easily.

The honesty angle of the employees at sensitive posts, at promotional stages and at the stages when they are being assigned duties of substantial importance should be checked. The service rules should make it that honesty angle checks are essential ingredients for all employees. The clearing process must utilise the modern scientific and technological aids, including the following:

- Polygraph tests for Detection of Deception
- Psychological stress evaluator test
- Brain printing
- Narco test
- Hypnosis

26.3.2 Computer Experts

Computer programmers and computer consultants; individuals and firms, know that how a little change in the programming (computer commands) can make big changes in its functioning for financial matters or for mischief. The charm of the easy and plentiful money easily influences some of these specialists. They go astray. They "utilise" their skills to make a fast buck. Some of these computer and cyber space experts commit multi-crores rupee frauds.

1. *A life insurance company utilised a computer to collect about 2000 crores dollars illegally.*
2. *Stanley Mark Rifkin, a computer programmer collected 10.2 million dollars in one go.*
3. *Two computer programmers caused damaged worth about one million dollars to the computer system of an organisation.*
4. *Even a non-expert churned out receipt worth over Rs 27 lakhs.*

Unfortunately, computer experts are essential and indispensable. Big organisation must have such experts on their pay-role, but their integrity must be checked periodically. Those who cannot

have experts of their own must choose part-time experts of proven integrity. Wayward experts can prove extremely costly. "Eternal Vigilance" is the word to cope with the specialist crook.

26.3.3 Other Computer Criminals

- Competitors, both indigenous and foreign
- Hostile (even "friendly") foreign powers
- Detectives
- Mischief mongers
- Professional criminals
- Hackers/crackers in varied forms.

It has been estimated that in the USA, number wise, the disgruntled, retired, dismissed, or temporary employees commit about 75% of the computer intrusion crimes.

26.3.4 Handling

It is heartening to note that the Indian government is aware of the positive and negative potential of information technology. It has created a ministry to deal with the various aspects of the cyber world. It is hoped that the technology will receive due impetus to usher in the new era, and the authorities take the necessary step to tackle the high-tech crimes which it is spreading like wildfire.

26.3.5 Laws, Legislation

The Government of India has already enacted an Information Technology Act, as the existing enacted laws in India, were inadequate to deal with cyber crimes. Additions to the Information Technology Act to meet the new problems are done from time to time.

The three main streams of criminal laws are the Indian Penal Code (enacted in 1860), The Indian Evidence Act (enacted in 1872) and The Criminal Procedure Code (enacted in 1973). They did not contain provisions relating to computer crimes. It was, therefore, apparent that new laws had to be framed to permit efficient handling of the cyber crime, the con artist and the intangible evidence thereof. The government has therefore amended these laws also to cover electronic evidence. The ongoing process of amendments of the existing laws continues.

The Indian experience in the actual functioning of information technology is limited. The experience relating to cybercrime is still less. It was, therefore, imperative that the experience of the developed countries, where the crime is prevalent for the past few decades is utilised. The prominent organisations, which have the expertise, are:

1. Organisation for European Co-operation and Development (OECD)

   The organisation has already issued a set of guidelines. They continue updating the same. These publications are useful.

2. The United Nations Organisation (UNO).

   It has published a crime control manual. It is a very useful guide. It is updated periodically.

3. Some countries like the UK, USA, Germany, Japan, and France have framed laws relating to computer frauds. Their experience is of immense help.

Lawmakers in India have utilised the above available expertise in framing the "*The Information Technology Act, 2000*" and its amendments. It is updated from time to time as per our experience and needs.

26.4 PREVENTION

> The watchword for prevention of computer crimes is:
> **"Eternal vigilance"**

Even with the best of laws, with efficient investigating agencies and full national and international co-operation, the successful right conclusion in many cybercrime investigations will remain a difficult proposition in most of the crimes for the reason already mentioned. The emphasis, therefore, should be on the prevention of cybercrimes.

A lot of research is going on to make the system completely secure. Tangible results are also forthcoming. However, the information technology is advancing at such a pace that its security system is not keeping pace with the advancing technology. The con artist pursues and peruses the developments. He tries to be one step ahead of the security system developments. The security specialist, on the other hand, tries to reverse the position. This is a race; the righteous should win.

Philosophically prevention of computer crime is real homework. Secure the target.

The pursuit of the computer criminal, on the other hand, is an unending race in the cyber space against time, against the unknown criminal and against the intangible data in all its varied forms and processes, (input, output, throughput). Prevention, therefore, should be easier, less expensive and more successful.

26.4.1 Access

Only authorised persons should have access to computer. Even close colleagues should not be allowed to use/misuse the computer. The authorities must evolve an adequate system of identification and authorisation of control and access. If more than one person are authorised to work with the same computer, a log of the persons who used the computer with date and time is kept.

26.4.1.1 Passwords

Access to the computer is frequently controlled by passwords. The management should ensure:

- Passwords should be personal, secret and unique. "One password: One person" should be the rule. If an operator changes, the access password to the computer should also change invariably.
- Password should be alphanumeric and longish — not easily guessed/picked up by an unauthorised person.
- Password should be changed periodically. The importance of the data being handled should determine the periodicity. After the specified period, the password should pass off automatically.
- The operator using the password must know (or made to realise) that all work done on the computer with the password will be his responsibility — he should acknowledge this in writing, and cautioned not to pass on the password to any person, however close or intimate.

26.4.1.2 Cards

Authorisation through cards insertion is another or additional security system. The card is inserted in the computer and the computer matches the data to allow/deny access to the

computer/specified data/information in the computer. Unless the card is stolen and misused, the card provides adequate security. Two types of cards are in use:

- **Magnetic strip cards;** they carry the authorisation and identification data in MICR. The computer reads the message and allows/disallows access to its specified data.
- **Microchip cards;**[2] they contain a microchip with memory. The computer does the identification. It allows/disallows access, depending upon match/non-match of the data on the card.

26.4.1.3 Biometrics

Forensic Biometry offers the best passwords. They are individualistic and non-transferable, theft proof and even forgery proof. They can certainly keep an intruder at bay.

Access through biometrics data is the most secure in-thing in data protection. It permits access to the computer only to the authentic user. Iris/Retina images, fingerprints and voiceprints are being utilised for the purpose. Fingerprints are more popular. They are individualistic and hence offer excellent security against the intruders. Their complex nature, however, has been the bane for their universal adaptation so far. However, researches are removing the impediments. It is hoped they are used on a large scale in the coming times.

26.4.1.4 Secrecy

There is enormous data in the computers. Often a user needs only limited data for his *bona fide* use. Whenever possible a user should have access only to the relevant data. The other data should not be accessible to the user of other data files. Passwords can safeguard the data against the unauthorised intruders.

26.4.1.5 Integrity

It is essential to preserve the integrity of the data stored in the computers. It should not be possible for an intruder to alter, destroy or contaminate the stored data. The following steps help:

1. The routine computer workers should have one way computer terminals, so that the operators should not be able to alter or erase the data in the computer.
2. The operator should not abuse or allow the abuse of official computers for personal purposes.
3. The operator should use only authorised data.
4. The operator should alter only authorised data.
5. An opened computer is not left unattended.
6. All changes in the vital computer data should be authorised/supervised at least by two persons. The data should be checked before and after the changes in important cases.
7. Alterations of data include additions, deletions, modifications, creation, storing and transport of data. The work must be trusted not only to competent persons, but they should also be highly trustworthy. The supervisor must check the work.
8. The operator must be assigned the duties/responsibility in writing.

2. A chip card is a standard-size plastic card that contains an embedded microchip. The chip encrypts information to increase data security when making transactions at a chip-enabled terminal.

9. The working instructions are given in writing. A certificate that the official has been read/understood them is obtained. The certificate helps to fix responsibility and accountability in case something goes wrong.

26.4.1.6 Staff

The most important entity for security against computer crime is the proper selection and training of the operators. The integrity of staff employed in computer work should be above board. In addition, they must be intelligent, experienced and dedicated to their work. Further, they must be checked periodically for their integrity through scientific methods, as a part of the system, routinely. A person may be highly intelligent, extremely efficient, yet if his integrity is doubtful, he is positively a potential source of serious trouble and hence a great liability to the organisation.[3] There should be stringent rules and practical action modes to keep an organisation free from the dishonest employee at all levels. The importance of this aspect is apparent from the fact that the staffs commit 75% of the computer crimes or they are committed with their collusion. The following steps keep the bunco at bay:

1. Create security consciousness.
2. Screen, for security, even the highest, who are involved with security sensitive data.
3. Train staff in security management.
4. Do not give sensitive seats to temporary or new employs.
5. Provide an action plan to the concerned; if and when computer crime is committed.

The supervisory staffs have to be computer literate so that they can understand how the system works. They should develop an eye to detect criminal activity and, thus, ensure against the onslaught of the criminal. A drill for the supervisory staff is evolved and carried out periodically to ensure crime-free working of the system.

26.4.1.7 Accountability

It is important to fix responsibility in case a crime is committed. This is possible if exhaustive working instructions and inflexible rules for all prevail and updated periodically. A copy of these rules is provided to each member of the staff who acknowledges its receipt and furnishes a certificate that he has read and understood the rules. The staff must realise that any crime committed through their access mode or through their computer, is their responsibility.

26.4.1.8 Logging

Logging is keeping the record of the work done on/with the computers. Proper logging helps to find out:

- The time of occurrence of crime
- The nature of occurrence: intentional or accidental
- The possible perpetrator
- The extent and ramification of the crime

Proper logging is the main source of information for ultimate processing of computer crime. It should, therefore, be introduced in the working schedule of the computers, even if new software may have to be introduced in the system.

3. India it has been found that in 64% of the bank frauds bank employees, mostly seniors, is involved.

There are various logging systems for various types of applications:

- Security log
- Transaction log
- Work log

Induction of date, time and user's name are useful, especially when a number of persons use the computer. It is not a necessity in personal or standoff types of computers when only one person is using them. The information is still useful if an unauthorised person handles/mishandles the computer.

The supervisory staff must check periodically that the logging is being done properly and that no unauthorised activities/work has been done on the computer.

New generation of computers, provide the time data itself.

26.4.1.9 Encryption

Computers are being utilised extensively to transmit information, entertainment materials, teaching materials, and messages through network and Internet, through cables, microwave transmitters or through satellites. The transmission and receipt of these messages are increasing progressively. It can be misused by the unscrupulous if it is not protected. Coding has been extensively utilised to keep the information confidential and secret. Encryption technology to code the messages is, therefore, the necessity of our time. The only alternatives to encryption are:

1. **Dedicated lines**; they are too costly especially for long distances. They are being used for Local Area Network only.
2. **Special modems**, two modems work in tandem, one at the dispatch site and the other at the receipt site. They recognise signals from each other and thus, messages are conveyed.
3. **Dial back facility**, in this mode the information is transmitted only when the party at the receiving end dials back for the message.
4. **Optical fibres**; for local area network if, instead of usual cables optical fibre is used, the messages can be protected from wire-tapping. The optical fibres do not emit electromagnetic rays. It prevents interruption and misuse of the messages.

Encryption has been in use in other modes of transmission also, especially in the wireless message. The same technology, with additional modern safety features, is used to transmit messages through networks.

26.4.1.10 Physical Protection

Theft, destruction of computers, induction of virus and logic bombs and erasing and alternations of data in computers are hard realities. Besides, accidental fires, arson, explosion, and natural calamities like earthquake, hurricane and storms are also realities, which have to meet with. Computers and computer contents, therefore, need physical protection. It follows the usual safety pattern. Additional safety measures needed for computers are:

1. Duplicate tapes, diskettes of data, command and log systems are preserved at off-site places.
2. The duplicate files are updated periodically.
3. The functional ability and the utility of the duplicates are checked periodically.

The back-up information, thus preserved, proves an invaluable guide in case of computer crimes. They may indicate the perpetrator; permit the assessment of the losses and the reconstruction of the original facility.

Computer crimes in India are yet limited but they are round the corner. They are truly colossal, global and novel. Their investigations are highly intricate and daunting. Prevention is the best alternative to the investigation. It is comparatively easier.

> *In a case of fraud, a forger forged receipts with the help of a computer. The genuine signatures of the victim were scanned on to a computer and the signatures of the victim were printed in blue ink on the receipts worth 40 lakhs of rupees. The duplication and their perfect 'replication' revealed the crime. (CH)*

26.4.1.11 Security Software

The security of data in the computer is of great importance. A lot of research inputs are brought in many software to secure the security of the digital data in the computer. The fraudster is also putting in lots of efforts to cross the security barriers. In fact, continuing war between the keepers and breakers of security goes on. The keepers of law have adopted a multi-pronged approach to meet the menace:

1. Intricate entry passwords
2. Induction of intrusion detection devices
3. Introduction of security savvy procedures and policies
4. Promotion of awareness programs
5. Use of preventive software (fireballs and the like)

26.5 COMPUTER CRIME INVESTIGATION

Investigation of computer crimes where the computer itself has been stolen, broken and burnt follow the usual techniques used in the investigation of crime against property and offers no special problem. The other crimes involving computers are tampering with software either while handling the computer or through the Internet or network. Both types of crimes need a thorough knowledge of computers. Computer experts are indispensable in the investigation of such crime.

26.5.1 Basis of Investigation

Location, collection, preservation and dispatch of the evidence to the Forensic expert are Practical Police Work (PPW), carried out by law enforcement and other agencies. The success or failure of the investigations and trials depends upon these basic processes. They generally follow the general crime investigative pattern, yet because of the high complexity of the technology and miniature nature of the devices it needs certain extra care in handling of the evidence to save the evidence from alteration deletion, destruction, contamination, mutilation or even from substitution. It is essential that the investigating officer understands the basic principles and follow a set protocol to get the maximum and correct information to ensure successful investigations.

26.5.2 Principles

The investigator of computer crimes must observe the following main principles:

1. The scene needs the immediate presence of a police officer. One is, therefore, dispatched at once, on receiving the call so that the evidence at the scene is not lost, stolen, contaminated substituted or destroyed. He performs his tasks,[4] keeping strictly in mind**: "As is, As it was"**:
   - Gets the scene vacated from curiosity hunters and others.
   - Barricade the scene.
   - Save and preserve the fugitive/volatile evidence as far as possible.
   - Assess the men and material needs of the scene for proper handling and inform the IO about the assessment.
2. The evidence and action pertaining to the computer must be handled within the framework of the law.

Data stored in the computer or storage media must remain intact if it is to be presented to the court. A computer involves high technology. It needs careful handling. It brooks no fiddling. The wealth of information, it carries, can get altered lost, contaminated or substituted. The contents in the seized computer should remain:

"As is, as it was."

A technically correct facsimile of the retrieved evidence is prepared and used in all processing, keeping the original data safe.

3. If the data, in the seized computer is required during the investigation, its duplicate is prepared and used. A competent expert duplicates the contents; who ensures and certifies that the original is as it was.
4. All actions (seizure, processing, and storage) in respect of the computer or other like device are properly logged; date wise and time wise, along with the operator name for later verification, if required.
5. While collecting, packing, transporting or storing the computer, ensure that it does not fall or rattle in the container. Pack it in a hard container with proper padding.
6. The identity (*vis-a-vis* the crime), authenticity, integrity and continuity of the chain of possession of the evidence seized must be beyond reasonable doubt, through proper documentation. Proper inventory on the label tag and a properly secured package of the evidence goes a long way to maintain the identity/integrity of the seized computer (or other evidence).
7. Computers have volatile (unsaved) data in RAM. It gets lost if the computer is closed before saving the data; ensure it is saved.
8. If there is some data on the screen of the monitor, it is photographed.
9. Computer crimes are new to India. An average investigating officer has no basic knowledge no training, no practical experience to perform the tasks of handling the computer at the scene, or the evidence thereof. It needs a competent Computer Forensic Expert. The investigation, therefore, needs **S**pecial **I**nvestigation **T**eam **(SIT**) to ensure proper investigations**.** SIT should consist of:

4. See chapter 4 for discussion on the Scene of Occurrence.

- **Chief Investigator; h**e is the team chief. He should be an experienced police officer. He will have the over-all responsibility to assemble the desired (and pre-fixed) team, assign duties to the team members and oversee that the team, individually and collectively performs their duties efficiently and competently. He writes a report on the examination of the scene of occurrence after completing the examination of the scene.
- **Documentation Officer:** He has to be a technician of a high order to document the work done at the scene. Videographic and photographic coverage of the scene and the evidence thereon is his main task. Preparation of a site plan [sketch(es)] of the scene including evidence thereon may be his additional duties. His photographic coverage must show the configuration of the various units and location sites from where the evidence is seized.

  Sometimes the services of a draftsman are requisitioned for preparing the site plan, especially in expansive and important scenes.

  Chief investigator himself write the textual description of the scene for documentation, usually.
- **Computer Forensic Expert;** he helps **s**eizure of a conglomeration of the computer setup and other related evidence. A competent computer forensics expert should form part of the SIT to guide the dismantling and collection.
- If the technical staff of the company manufacturing, installing and/or maintaining the installations is available, their services are obtained for the best results. Nearby outlet of the computer system/device should invariably be located, checked and services requisitioned whenever possible.

26.5.3 Action Protocol

The chief investigator takes over from the first police officer on reaching the scene. He plans the action protocol for the SIT team, guides, controls, and monitor the work. He takes a round of the scene and checks the first police officer's assessment relating to the needs of men and materials and augments SIT if found necessary.

The action protocol is to:

1. Document the location of the scene through video, still photography, sketches and descriptions.
2. Record the configuration of the computer assembly through photographs, sketches and written description.
3. Photograph the visuals on the screen. Save the unsaved contents of the computer.
4. If the computer is on, it needs immediate attention. It has to be shut down. The computer expert decides the shut down mode. It may be by pulling out the power plug or through the operating system of the computer. It has to be done at the earliest to prevent any malware to continue tampering/destroying the evidence.
5. Record the condition of the evidence and condition of the place of recovery. In some cases, the device is found damaged. The factum is recorded carefully. The cardinal principle is the evidence must remain unchanged during collection, preservation, packing, transport.
6. If the collecting expert has done something to resurrect the computer, it is recorded.

7. Seize the computer in the presence of witnesses, observing all other legal formalities as in the case of other evidential clues. Preserve, pack, transport and store the evidence in such a manner that its identity, integrity, authenticity and chain of possession are not compromised.
8. Seize the associated equipment (accessories, CDs, Pen Drives, notebooks, Backup hard disks, floppies, connecting cables) found at the scene.
9. Seize laptop, notebooks, I-Pads and cell phones of the suspect. They may also contain data useful to ascertain the facts of the case in hand.
10. If the computer is "**on**" ensure that the unsaved data is not destroyed. It must be saved and recorded before any other thing (pulling out the power plug!) is done.
11. Collect extraneous evidence (fingerprints, blood or perspiration stains or dirt) on the computer. If the computer is found abandoned and its possession (theft of the computer!) is disclaimed, these traces may link the computer with the user or the culprit.
12. If there is no Computer Forensic Expert in the team, requisition the services of the expert immediately from the manufacturer side or from the departmental digital Forensic laboratory. Most the Forensic Science Laboratories in India have the expertise, though with limited facilities and varied competencies.
13. Obtain the password and other security code, PIN. The suspect may or may not give the same easily.
14. Record the identification data of the computer and its various parts for their identifications. The data may lead to the owner in case the computer is lost or when it is found abandoned or left at the scene or elsewhere.
15. Collect the relevant papers, files and brochures found at the scene. They provide sometimes clinching evidence to help solve the crime.
16. In addition to the above, record:
    - Who seized, collected, packed and sealed the evidence? He must be legally competent to do so.
    - What was the condition of the evidence when it was found?

The investigation techniques of computer crimes are varied according to the nature of the crime. However, certain basic aspects are noted here.

1. The investigator must understand the functioning of the computer, the cyberspace and the Internet. He has to be either a computer technologist. Or, he must procure the services of a computer expert.
2. Even when information sent *via* Internet is deleted or overwritten it can be recovered. It needs the skill to locate and collect it.
3. In crimes involving Internet, the information is distributed on many computers. The information could be coded. The successful investigation is possible only with the help of a computer expert. It is not feasible to collect all the hardware. A selection is, therefore, made in some cases and the computer expert is the right person to do so.
4. The evidence in computer crimes, as in other crimes, consists of the following:
    - Instrument of crime
    - The object of the crime
    - The product of crime

- The *modus operandi*

  They have to be located, identified and collected or recorded.

5. Prevention is far simpler and less costly than investigations.

Computer crimes are yet limited in India. However, the state of affairs cannot continue for long. Computers have unprecedented potential for unlawful gains, for mischief and for excitement. The potential has dawned upon the criminals to computer crimes. They understand its mechanics and its potential, they are letting loose hell on earth. Bank frauds, money laundering. Narcotic trades and cyber terrorism are some of the big fat hens. More are coming. The law keepers must gird up their loins and fight the daunting new crime, preparing themselves to fight and maintain control over the ongoing and the fiercer onslaught of the menace.

26.6 FORENSICS EXPERT INVESTIGATIONS

Fig. 26.2
A write Blocker prevents Additions/Changes to Hard Disk

Computer forensics investigations involve high computer technology. Computer technologist has to know not only but he has to understand the mechanizations of the computer forensics criminal and to tackle his depredations and evidence thereof to pin him with the crimes.

The depredation work is highly specialised and so is its counteraction. They will just be mentioned. Details are beyond the scope of present discussions.

Computer forensic investigations process is done on the duplicate data acquired from the original. The latter is not used as it has to be produced in the court in its original form. The advent of equipment and software for acquisition has made it possible to work with the duplicates.

The investigation follows the usual standard digital forensic processes:

1. Acquisition of the data from the computer.
2. Examination/analysis of the data.
3. Submission of report on the findings with reasons and illustration. 26.6.1Tools and Techniques

26.6.1 Tools and Techniques

A number of open source and commercial tools have come up for computer forensics investigation. Typical forensic analysis includes a manual review of material on the media,

reviewing the Windows registry for suspect information, discovering and cracking passwords, keyword searches for topics related to the crime, and extracting e-mail and pictures for review.

Some of the tools and techniques used are:

1) General tools
2) Disk tools and data capture
3) Registry Analysis tools
4) File viewers
5) File and data analysis tools
6) E-mail Analysers
7) Internet analysis tools
8) Encryption decoding tools
9) Password cracking tools

The list goes on.

The main types of problems are:

- Acquisition of volatile files, deleted files, and hidden files
- Recovery of steganographic data and images
- Identify the stolen data/files
- Password cracking
- Encryption decoding

Numerous tools and techniques have come and the problem is being tackled efficiently. Some of the problems, tools and techniques are discussed below.

26.6.1.1 Volatile data

If a live computer is seized, it is likely to carry volatile data on RAM. It has to be acquired before the computer is shut down; otherwise, the data is lost computer. Google's COFEE tool may be used for the purpose. However, many other tools have come up. Or, it may be transferred to the hard disk.

It is better if the live computer is transported to Computer laboratory for the acquisition of the live volatile data.

26.6.1.2 Deleted files

Most operating systems and file systems do not always erase physical file data, allowing investigators to reconstruct it from the physical disk sectors. Modern forensic software has tools for recovering or carving out deleted data. It involves searching for the needed files within the disk image and reconstructing deleted materials.

26.6.1.3 Data Theft

Stochastic forensics is a method to forensically reconstruct digital activity lacking artifacts, by analyzing emergent properties resulting from the stochastic nature of modern computers. Its chief application is the investigation of insider data theft.

26.6.1.4 Steganography

Pornographic images and incriminating evidence is often hidden in other innocuous images. Computer forensics scientist can fight this by the hashing the file and comparing it to the hash of theoriginal image. The images appear different if it contains steganographic writings/ images.

26.6.1.5 X-Ways Forensics

X-Ways forensics is an advanced work environment for computer forensic examiners. X-ways forensics is more efficient to use after a while, often run faster, finds deleted files X-Ways forensics is fully portable.

26.6.1.6 SANS Investigative Forensic Toolkit (SIFT)

It is a multi-purpose forensic operating system which comes with all the necessary tools used in the digital forensic process. It comes for free of charge and contains free open source forensic tools.

26.6.1.7 EnCase

EnCase is another popular multi-purpose forensic platform with many nice tools for several areas of the digital forensic process. This tool can rapidly gather data from various devices. EnCase can be utilised to examine Active, Latent and Archival data without altering the evidence. It also produces a report based on the evidence.

26.6.1.8 Computer Online Forensic Evidence Ext (COFEE)

It is a tool kit developed by Microsoft to gather evidence from windows system. It can be installed on a USB pen drive or external hard disk. Just plug in the USB device in the target computer and it starts a live analysis. It comes with 150 different tools with a GUI based interface to command the tools. It is fast and can perform the whole analysis in as few 20 minutes.

26.6.1.9 Bulk Extractor

It is another important and popular digital forensic tool. It scans the disk images, file or directory of files to extract useful information. It is faster than other available similar kinds of tools. It is basically used by Intelligence/law enforcement agencies to solve cyber crimes.

26.6.1.10 Registry Recon

It extracts the registry information from the evidence and then rebuilds the registry representation. It can rebuild registries from both current and previous windows installations.

26.6.1.11 Forensic Toolkit (FTK)

FTK is able to make forensic copies and “hash” the evidence, FTK is easy to use and provides an investigator with the ability to view Active, Latent and Archival data without altering the evidence.

New and improved tools and techniques are continuously coming up

26.7 REPORTS

Report contains a detailed summary of all the work done and conclusions reached in computer Forensic investigation of a case. It contains:

1) The experimental Work and tests
2) The examination and observations
3) The data generated
4) The inference drawn with explanations

A good report relies on solid documentation, notes, photographs and tool-generated content. In general, the report may include the following information:

1. Identity of the Computer Forensics expert
2. The institute where the exhibits were examined
3. Referral authority's name and address
4. The name of the officer who brought the exhibits to the laboratory
5. The name of the person who liaises with the expert for the case
6. Date of receipt of exhibits.
7. Date of report.
8. List of items (with their description: serial number, make and model) submitted for
9. The equipment and set up used in the examination
10. Brief descriptions of the exhibits examined and data collected/retrieved (graphics, image, searches, and recovered erased files)
11. Supporting materials such as printouts of particular items of evidence, digital copies of evidence
12. Chain of custody documentation
13. Details of findings
14. Specific files related to the request
    - Other files, including deleted files that support the findings
    - String searches, keyword searches, and text string searches
    - Internet-related evidence, such as Web site traffic analysis, chat logs, cache files
    - E-mail and news group activity Graphic image analysis
    - Data analysis
    - Techniques used to hide or mask data, such as encryption, steganography, hidden attributes, and hidden partitions and file name anomalies

26.8 ADDITIONAL READINGS

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2. A. Marcella, R. Greenfield. 2002. *Cyber Forensics.* CRC Press.

26.9 CASE LAW

26.9.1 Computer Records Confession[5]

> The other aspect on which great emphasis has been laid by learned counsel for the appellant is regarding the manner of the recording of the confessional statement. Evidence of P.W. 131 ASI Kamlesh is of great importance. The confessional statement runs into

5 *Davinder Pal Singh v NCT Delhi*, 2000 Cr LJ 2034.

9 pages. The witness has categorically stated that she had recorded the confessional statement on computer as per the dictation of the DCP. In her cross-examination, she has stated that the time taken was 6 hours. The accused has taken a stand that his signatures were taken on blank papers. As noted above, the accused never made a grievance about any deficiency in the confessional statement till 19-4-1995. That is of great significance. Merely because the confessional statement was recorded in a computer, it cannot be a ground for holding that the confessional statement was not voluntary. Similarly, as DCP has given a certificate in typing when the requirement is that certificate has to be "under his own hand" that is urged to be illegal. It would be too technical to discard the confessional statement or doubt its authenticity on that score. This is merely a procedural requirement. The non-observance does not cause any prejudice to the accused. It has not been shown as to how the accused was prejudiced by the certificate having been typed. The procedure is handmade and not the mistress of law, intended to sub-serve and facilitate the cause of justice and not to govern or obstruct it. Like all rules of procedure, the requirement of record "under his own hand" demands an approach which would be rational and practical and not otherwise. Such minor deficiency, if any, cannot be considered to be a fatal factor so far as prosecution case is concerned. There is one more important aspect which needs to be noted. Admittedly, the accused was a fugitive and was on the run. At the Indira Gandhi International Airport he was arrested for travelling on a forged passport, it has been accepted by the accused in his statement recorded under section 313 of the Code that he had sought asylum in Germany and was deported from there on refusal of asylum. As the records reveal Shri K.S. Bedi (P.W. 130) brought to the notice of Shri B.S. Bhola (P.W. 121) that on 22-1-1995 the accused wanted his statement to be recorded under section 15 of the TADA and requested Shri B.S. Bhola (P.W. 121) to do the needful. Shri Bhola talked to the accused after sending everyone except his P.A. (P.W. 131) out of the room, and asked him whether he was making a statement without any fear or duress etc. He was also intimated that the statement could be used in evidence against him. Despite that, the accused wanted his statement to be recorded. Shri Bhola had given time to the accused till 23-1-1995. The I.O. was directed to produce the accused on the next date at 2.00 p.m. On 23-1-1995 the accused was again produced in the office of Operation Cell, Lodhi Estate. He was asked whether the statement was voluntary or under pressure. After ensuring that all procedures and safeguards have been observed the statement was recorded. A mere statement that requisite procedures and safeguards were not observed or that statement was recorded under duress or coercion, is really of no consequence. Such a stand can be taken in every case by the accused after having given the confessional statement. It could not be shown as to why the officials would falsely implicate the accused. There is a statutory presumption under section 114 of the Evidence Act that judicial and official acts have been regularly performed. The accepted meaning of section 114(e) is that when an official act is proved to have been done, it will be presumed to have been regularly done. The presumption that a person acts honestly applies as much in favour of a police officer as of other persons, and it is not judicial approach to distrust and suspect him without good grounds therefor. Such an attitude can do neither credit to the magistracy nor good to the public. It can only run down the prestige of police administration.

CHAPTER 27

DIGITAL IMAGE FORENSICS

SYNOPSIS

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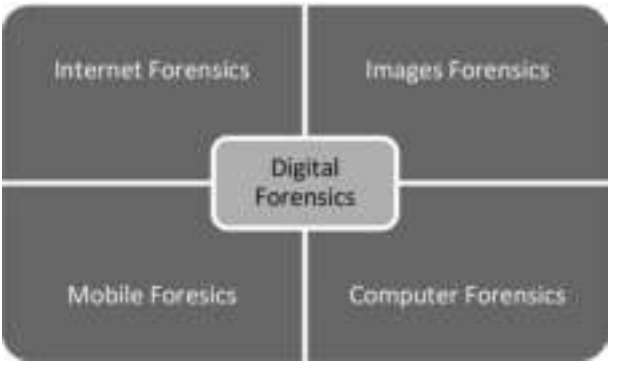

Fig. 27.1

27.1 GENERAL

Photography means writing with light. Forensic photography; therefore, connotes writing with the light of (or about) the evidence used in courts cases. In simple language, it is the photography relating to evidence, the places where the evidence is found, and of persons who are connected with the evidence/crime.

Traditional photography utilises light-sensitive material (on plates, films, paper) for recording the images focused thereon from objects of photographic interest through camera

lenses. The light from the object falling on the light sensitive materials brings in a chemical change in the material. The extent of change is relative to the intensity and amount of light energy, which falls upon the site or the format from where the object being photographed. The images formed at this stage are invisible (latent). The format carrying the latent image cannot be exposed to light as the residual light-sensitive material, on exposure to light, undergoes the same change and mars the image.

The images so produced are called negatives because the brighter parts of the photographed object appear darker and the darker parts come up in the lighter shade on the format. The negatives are made visible by developing and fixing them by chemical treatment in darkrooms before they can be seen.

The negative is used to print the photograph in natural shades of the object. The final photograph is appraised in court.

The traditional photography ruled the roost till recently. It still continues but it is falling out of grace rapidly. Many firms who have not adopted the new technology of digital photography have gone bankrupt.

Digital photography has taken the world by storm and almost literally uprooted the old order completely. Digital photography had its birth pangs in the initial stages. The inferior images at that stage brought in a lot of criticism and rightly so. However, continued developments have brought the image quality at par with film photography. Digital photography has come to stay in the image world with vehemence and has been adopted, nay grabbed, both by the professional and the non-professional.

It has come up of age now.

Digital photography is a completely new concept of writing with light. It has dispensed with:

1. **No chemicals-based processes**; light-sensitive films/photographic paper for capturing the images; and the satellite chemicals used to develop, fix or print photographs are not needed in digital photography.
2. **Dark room studio is no longer** required in digital photography.
3. **Time Lag:** there is no time lag to check the picture taken. The results are checked within a fraction of a second! A second snap can immediately replace the defective one. Images in the digital camera can also be viewed/reviewed on computer or TV. This facet of digital photography is of great value in Forensic science.
4. **Necessity to reload at crime scene:** the camera's light sensor can take hundreds of photos in one go and its memory card can store them in a way that is easy for retrieved/reviewed without fuss. With film camera reloading is needed after 24/36 exposures (snaps).
5. **Identification data chit:** the metadata can be inserted in the photo at the time of printing with the computer.
6. **Camcorder:** some digital cameras play a double role**;** they can function both as a camcorder or still camera. The former role is indispensable to document the scene through video filming.

The advantages of digital imaging over traditional film photography are overwhelming and include:

1. **Image processing;** it is easier, quicker and permits multiple modifications of the image. Colour, contrast/size manipulation are done with ease. The induction of the editing in the camera itself gives colour-balanced image itself.

2. **Minimal ongoing costs;** sophisticated digital cameras are costly. But it is one time investment. Ongoing cost is minimal. Storage and transfer of photographs are both time and cost-effective.
3. **Permanence of colour;** the colours of the images, unlike that of photographs, do not fade with the passage of time: an important advantageous over the film photographs. However, they can be deleted accidentally or by a mischief monger, when they are in the cameras/computer.
4. **No quality loss;** the digital image can be copied from one digital medium to another without any quality loss.
5. **Anti-vibration function;** some digital cameras have anti-vibration device in the camera itself. It obviates the necessity of a camera tripod stand. However, tripod stand should be used in some situations like the crime scene.
6. **Small size sensor;** the picture taken can be checked within a fraction of a second! Instant review!
7. **Transfer;** images can be transferred, copied, e-mailed from one digital device (computer) to another with no cost or quality loss.
8. The cost of snaps, prints or storage is minimal.
9. **Viewing on TV;** many digital cameras now include a connector (and cable) to allow the display of photographs to an audience using a television set.
10. **Processing** is not only easier but it is also quicker. More efficient tools and techniques are helping the process.
11. **Editing of d**igital images in the camera/computer offers tremendous modification possibilities which are more aesthetic, quicker and easier *vis-à-vis* film photographs.
12. **Metadata** identifies photographic data. In digital photography the case data (FIR, PS, Date, and IO's name) is the metadata of a photograph taken relating to that case and the photograph data (camera, speed, flash also metadata) is the meta data. It can be inducted easily in the photograph at the printing stage. It is not possible in film photography.

Recently advances in digital imaging have brought digital cameras that not only compete with the best film cameras, but some of them even surpass them also. In fact, other advantages in digital imaging are so overwhelming that the film cameras are being replaced by all and sundry, most eagerly by the professional photographers. The 16 megapixel models can produce detailed images that are considered better than 35 mm film images.

Roger Clark was a photographer working in scientific imaging at the time he came up with this "film crossover to digital" has made a chart. He's looking at the images produced by cameras as young as the Canon 1Ds Mark II, which came out in 2004. Cameras today (2019) are dramatically better in noise, and of course, some have more than doubled the 20 megapixel resolution at the top of his chart. He has got some of the best films ever made, resolution-wise, at around 16 megapixels in practical terms.

There are some, real or imaginary, disadvantages in digital photography (high consumption of batteries, for example). However, they are few and researchers are after them. They are being overcomed.

The induction of digital photography in the criminal justice system has been slow because of many taboos. But now, the law enforcement agencies are ardent followers of the technology.

27.2 IMPORTANCE

Photography is extensively used in Forensic and police science because it provides realism in the presentation of evidence and psychological satisfaction to all concerned that they have viewed (and checked) the evidence personally. In some branches, it is indispensable. For example, in recording the scene of occurrence (SOO), in documentation of the criminal's or victim's identity, in recoveries, in the evaluation of disputed documents, in the presentation of the identity of the minutiae and in the demonstration of the common or different sources of the striations or other evidence one just cannot do without photography. Photography is being used in Forensics and practical police work, for over a century now. Important applications are:

- Documentation of the scene of occurrence
- Identification of the criminals (portrait or mug photograph)
- Identification of the victim and recording the injuries.
- Fixing the position of the evidentiary clues at the crime scene/other sites and their spatial positioning *inter se.*
- Recording evidence located through UV, IR and X-rays.
- Capturing the action of the culprits in mob violence, riots, vandalism (Videography!).
- Recording/preserving of perishable evidence.
- Recording latent/patent marks of all sorts (e.g., finger, foot, tool, or weapon marks on various articles).
- Illustrating evidence in courts to show common (or different) sources of origin. Examples: documents, fired ammunition, tool marks.
- A sting operation in corruption cases, in action.
- Surveillance photography.
- Necropsy and Mortuary Photography.
- Preserving the scene "live" (videography) and presenting it in the courts

The list goes on and on.

The film photography has served the police science and forensics for a long time, in diverse situations. The advent of digital photography is providing a better service: more comprehensive and less cost and time effective.

27.3 NATURE

There are many devices for the creation and recording of digital images. The prominent and common ones are:

- *Digital Camera*: It is the most important device for digital imaging in forensics. It is also nicknamed Digicam.
- *Scanner*: Scanners are used routinely and extensively to get digital images of documents and to convert photographs into digital form in Forensics (and other fields).
- *Computer Tomography*: It is a technique to get and record cross-sectional images in digital form. It is used in medical studies.

Scanners and computer tomography do not involve digital cameras.

Digital photography employs the following tools and techniques:

27.3.1 Digicam (Digital Camera)

Digital cameras are of many types and brands. The most popular digicam is the cell phone cameras which have made digital photography not only a household affair but has literally become a child's play also. The quality of the images obtained with cell cameras is almost always poor except in costly cell phones. They are not used in professional photography. Some costly cell phones have high quality software.

Professional Digicams vary tremendously in quality of the images produced. 'Point and shoot' types of cameras are convenient but they are not suitable for professional work of the media persons or for police or forensic work. Professional Digicams have to be special so that they can produce images comparable in quality to film photographs. The DSLR generation of the Digicams meets the challenges adequately. A newer innovative Digicam generation has come up which has dispensed with the reflecting mirror in the cameras.

Most of the digicams are meant for taking still images but some of them can take videos and record sound also. These dual duty performers are an asset to the investigator at the crime scene.

The professional photographers using DSLR cameras widely. The cameras have generally the following sub-systems:

1. **The Optical (lens) System:** In digicams the optical systems are similar to the systems used in film SLR cameras.
2. **The Shutter and Diaphragm:** the **gadgets in** DSLR correspond to those found in SLRs in film cameras.
3. **Image Recording:** Digicams use light sensitive sensors. There are two varieties:
   - **CCD** (Charged Coupled Device): CCD sensors are used more frequently than CMOS sensors.
   - **CMOS** (Complementary Metal Oxide Semi-conductor). They capture the image impinged on them.

The image captured in light sensors gives the image in digital data. The process modes offer many advantages.

4. **Images Storage:** A Digicam stores the recorded image in a digital data file, a memory card, which may be either in-built in the camera itself or it may be detachable and replaceable. The card is usually a solid state flash memory device. There are other systems for storing the information (mini-CDs, Floppy disk, CD-RWs), but flash memory is more frequently used. The systems used in digital photography are JPEG and TIFF file systems. It is always advisable to transfer the images from the camera to a computer at the earliest and store the images there.

   The whole process of recording and storage takes only a fraction of a second. The image is ready for viewing, reviewing and for final decision to keep it or delete it and to take another shot.
5. **Image processing:** The digital image, once recorded in the memory card, is ready for further manipulations. Some cameras allow some manipulations by themselves but processing in its varied forms is usually carried out in a computer. The following processes are routinely performed to bring out the best of the image:
   - Contrast enhancement or reduction
   - Editing and cropping (trimming) to remove unwanted parts from the image
   - Size manipulation

- Colour modifications
- Transfer to email, Facebook
- Merging the images
- Segmentation of the images
- Printing the images on any document site.

The digital image can be manipulated, displayed, printed, stored, transmitted, and circulated to all, in a jiffy, using internet and computer facilities. They are being used extensively in e-mails and Facebook, home pages, E-mails.

(a) Modification Possibilities

Digital images offer tremendous modification possibilities which are more aesthetic, quicker and easier *vis-à-vis* film photograph.

Some counsels object to the presentation of evidence through digital photography. They point out that in the absence of negatives (as in film photography) the authenticity and admissibility of the digital images in courts is doubtful because digital photographs can be easily manipulated/modified/replaced and distorted. The testifying expert has to vouchsafe their authenticity and integrity. His certification has to be accepted like that of bio or chemical evidence expert. In USA, the federal laws (rule 101 of Rules of Evidence[1]) are quite clear on the point. We have to adopt the same view towards digital photographic evidence.

The author has been presenting digital photographs in various courts including High Courts now for decades. Only in one court, however, the counsel objected to digital photographs. The author certified their authenticity on oath and also furnished a CD of the un-manipulated snaps taken from the original. (CH)

27.4 QUALITY CONTROL

There are a number of factors (given below), which influence the quality of the images captured in digital photography. Out of these, the first four factors hold good even for film photography. They, therefore, have not been discussed in the present discussion**.** The others have been discussed briefly.

1. Skill of the photographer
2. Photogenic quality of the object
3. Lighting of the object
4. Lens system
5. Light Sensor
6. Image processing devices

1. This Rule of Evidence relates to the Contents of Writings, Recordings, and Photographs. They include magnetic, mechanical or electronic recordings. The Rule states that if data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect data accurately, is an "original." A "duplicate" is defined as a counterpart produced by the same impression as the original...by mechanical or electronic re-recording . . . or by other equivalent techniques which accurately reproduces the original. A duplicate is admissible to the same extent as an original unless a genuine question is raised as to the authenticity of the original or in the circumstances it would be unfair to admit the duplicate in lieu of the original. This means a photograph can be stored digitally in a computer, that a digital photograph stored in a computer is considered an original, and that any exact copy of the digital photograph is admissible as evidence.

   Unless the photograph is admitted by the stipulation of both parties, the party attempting to admit the photograph into evidence must offer testimony that the photograph is an accurate representation of the scene. This generally means that someone must testify that the photograph accurately portrays the scene as viewed by that witness.

7. Pixel count
8. Memory card
9. Dynamic Range
10. Output Devices

27.4.1 Light Sensor

The change from film photography to digital photography starts with a light sensor — a device that captures the image, in varying intensities of light, in digitised data. The light sensors are essential part of digicams.

The main criterion, which determines the quality of the image, is the resolution of the pixels on the sensor. The acceptable pixel count for a good photograph is 4 Mega-pixels and above.

A rough value of the pixel count *(P)* can be found easily. If the value of horizontal pixels is *X* and that of the vertical ones is *Y,* then the maximum resolution is:

P = X x Y = XY,

[If *X* = 2400, *Y* = 1800], we have

P= 2400 x 1800 = 4320000 pixels = 4.3 Mega Pixels

Pixel count has a great role in the production of image quality. 4 megapixels are the bare minimum. Some photographers use cameras with minimum 10 megapixels. Still others feel 16 Megapixels are the ideal figure for top quality work.

Pixel count is not the only important factor, other factors are also important. Pixel count for quality consideration of the image is the pixel count of the final processed image and not of the camera format.

As discussed earlier, two types of light sensors are common: CCD and CMOS. The former is more common in digicams.

The size of the sensor also affects the quality of the image captured. Larger sized sensors produce better images.

27.4.2 Image Processing Device

The processing software handles the raw data collected by the sensor and produces a colour balanced picture. The device is important in determining the quality of the captured picture.

27.4.3 Memory Card

The image registered by the light sensor goes to the memory card for storage. It may be a permanent fixture of the camera or a detachable device. In some cameras, both systems are used.

The memory card is a digital memory device. Flash memory is the most common device. Floppy disks, CD-RWs are also used. The quality of the storage software also affects the image quality of the output pictures.

27.4.4 Dynamic or Luminosity Range

Camera systems catch images of objects having a certain luminosity range. If the intensity of light is higher, the brightness in the image will hide the details of the image. Likewise, when the luminosity is less, the darkness in the parts hides the details. In some cameras, the

luminosity range is extended. They provide better pictures with more details on a wide range of luminosity. They are a real boon for in forensics and police photography.

27.4.5 Output Devices

The main output device in digital photography is a computer. A high quality laptop meets the need admirably. It helps perform a number of functions and manipulation of the images:

1. Storage of images
2. Editing
3. Dimensional changes in images
4. Trimming, cropping
5. Contrast changes
6. Colour or brightness changes
7. Segmentation of the images
8. Transfer of images to other digital devices
9. Printing of the images on varied formats with the help of a printer

The camera, the computer, the CD-Writer, and Printer should all be compatible with one another to carry out the above functions.

27.5 APPLICATIONS

Digital imaging substitutes film photography technology and provides images in all those fields of police and forensics work where film photography was or is being used; of course with greater efficiency. It is also time and cost-effective. Thus, it is used for all the tasks; stating from the documentation of the scene of occurrence to the presentation of evidence in the court, keeping record of all evidence, of criminals, of victims and events. The main superior features of digital images over film photography are:

- **Videography of the Scene of Occurrence:** The videograph preserves the scene indefinitely and takes it to the court if the court so wants even after years.
- **Presentation of Evidence;** the editing of the digital images, in several ways (segmentation, changes in contrast, brightness, dimensions and synthesis of images) has made it possible for the expert to produce effective demonstrative and easily intelligible illustrations. The courts are appreciating the mode(s).

27.6 TINKERED DIGITAL IMAGES

Tinkering of photographs, also known as doctoring or faking of photographs, is a flourishing trade. It is extensively used in industrial publicity, trade and media, fashion industry, political campaigns, the publication industry, and in the entertainment industry. Additionally, doctored images even land up, not infrequently, in court presentations. It is also a favourite pastime (as well as a profession) of the con artist who indulges in the game for fun, mischief, blackmailing, pornography or even for character assassination. The problem is spreading all rounds and the number of con artists is also increasing with the passage of time.

Photographic tinkering started soon after the advent of photography. The historically famous synthesis photograph was that of the USA president, Abraham Lincoln and his arch opponent (*vis-à-vis* slavery) Calhoun. The synthesis (Head of the president and body of Calhoun), done in 1860, was crude compared to present day con-artists' standards. However,

it was a sensation of the time. There were no present day computers, manipulative software (Photoshop, 3D Max), or digital photography at that time.

Digital photography has changed the completely tinkering scenario. It has reduced the drudgery of the con artist. It is time and cost-effective. Above all, in competent hands, it gives results that can deceive most of the non-experts if not all. Software like Photoshop, 3D Max can produce fake synthesised images that can easily be mistaken for the real images.

Faking of photographs was not frequent or easy before digital photography because the processes involved not efficient. The results were often unsatisfactory. With digital photography, a seasoned con artist can synthesise a fake photograph from two or more images, which can hoodwink most of the observers. The quality of the fraudulent wonder is often so good that only a digital forensic scientist can ascertain whether the given photograph is doctored or not and he can do so only with gadgets.

Scientists have been at work both to create and to decimate the menace. The neck-to-neck race between the two groups goes on. If a solution to one menace is found, the con scientist comes up with a more sophisticated mode.

The Law keepers have better resources in men, money and materials. They have come up with numerous modes and methods, briefly mentioned below. Detailed discussion is beyond the scope of the present works.

The doctoring of an image, especially of a digital image, is done in a number of ways, including:

1. A part of the image is moved from one site on the image to a second site on the same image.
2. A part of the image is removed from the image all together.
3. An image is synthesised from two or more known or unknown images.

The creation of doctored images, to improve their aesthetic value and commercial appeal, is gaining ground. It is creating its space in the commercial world, and it is likely to continue its upward progress.

27.7 PROBLEMS/POSSIBILITIES

Manipulation of images has also created many a situation where a doctored image has brought in legal battles. The digital image expert has to jump into the fray to provide answers to the following types of questions:

1. Is the image under consideration authentic or has it been tampered and its integrity compromised by substituting, removing, or moving some part of the image?
2. Is the given image a synthesised image?
3. Was the given camera used to create part or whole of the given image?
4. Has the doctored image been synthesised from the given images?
5. Can an image be made safe against doctoring?

The doctored image is either a modified image itself; or, it is a synthetic product of two or more images. The synthesis is achieved now by digitising the original photographs if they are not already in digital form. The digitised images are transferred to a computer, if not created thereon itself, having editing and manipulative software. The images are processed further to get the doctored image. They may be changed to grey scale. The unwanted portions from the two are cropped off. The identifying characteristics of the remaining portions are equated

to match with each other in respect of colour shade, brightness and contrast and then the portions are merged together to make a connected whole image, a synthetic doctored image.

Digital image forensics can find answers to the questions, relating to doctored images posed above. The discrimination of a fake image from the authentic image is, thus, possible.

27.7.1 Tampering (Removal or Displacement)

The removal or displacement of a part of the image is called tampering. The tampered part of the image will have vastly different surface characteristics. The process does not introduce new visual artefacts. The following aspects help to establish tampering and the site where it was done:

- The affected area will have a vastly different statistical base.
- Colour filtering and interpolation indicate the change.
- Quality metrics of the affected area are quite different.

27.7.2 Image-camera Linkage

Every imaging device (digicam) is unique, consisting of a unique Lens system, light sensor system with individualistic digital count spread, flash memory and image processing system. They all induct their individuality in the prints they produce. Forensic analyst, by comparing the same with the image as taken through the device (himself or by others), checks the individuality and decides whether the test and questioned images had the common source or not. The important individualising features include the following:

- Sensor imperfections are always present in the light sensors and they are different in different sensors. They give defective pixel count. These imperfections are transferred to the images. Thus, the similarity in the defective pixels indicates a common source (same digicam!).
- Colour filter array interpolation is another data that indicate the common source.
- Demosaicing and radial distortions are generally useful data to indicate common or different digicam used to give the images under study.

The details of the tool and techniques to identify the common source can be perused from the additional reading of section 8.

27.7.3 Synthesised Images

The synthesis from two (or more) images, using computers, to produce a fake new image is the most frequent fraud in digital image forensics. It has been used for blackmail, character assassination, and revenge. It has caused a lot of misery and heartburning.

A lot of progress has been made during the last decade in making synthetic images. If sophisticated software like 3D Max is used for the forgery then it is difficult to detect the handiwork without proper equipment and expertise.

The differentiation is possible because it is not possible to create alike factors or circumstances, which influence the image. The light intensity may vary; the direction of light may vary; the striking angle of the light may vary, the optics of the camera may vary. The light sensor, flash memory and the processing software of the camera vary. Pixel count and pixel noises vary. All these (and more) combine to produce ample discriminatory evidence that is exploited by the digital image experts to differentiate the valid from the forged.

The expert approach uses machine-learning algorithms, modified to suit the original and synthetic images under study. They take the following parameters:

1. A wavelet-like decomposition is used to construct a statistical model of the images or their parts and compared *inter se*.
2. Wave-let coefficient histograms are calculated and compared.
3. The image acquisition processes of the computer generated and natural image are processed geometrically to determine the homogeneity of the image.
4. The sensor noises always exist and they vary from one digicam to another. The study of their pattern is also exploited to discriminate natural image from the synthetic image.
5. Chromatic aberrations permit discrimination of the fake from the original.
6. The synthetic images are smoother than original images. The difference can be detected and the two can be discriminated.

The detection of synthetic images is highly specialised. Only digital image expert should take up the work. The details of the various processes mentioned above are available in the literature (Additional Reading).

27.7.4 Prevention of Tinkering

The prevention of doctoring is assuming importance. We produce a number of images in the court. The court can accept the images as evidence only if they are authentic and their integrity is beyond doubt. However, seeing the images with the eyes alone cannot detect the fraudulent nature of a well-doctored image. It is also not easy to get certification about the authenticity and integrity of the image every time. Prevention of doctoring is the real solution.

One way to do so is watermarking the image, usually in the form of a code number, embedded in the image. The code number is imperceptible. The watermarking is done through software in the digital camera itself. The code number gets printed on all images (photographs) taken with the camera. If somebody tinkers with the image the code number gets disturbed. On extraction and comparison with the original, the doctoring (or natural original state) of the image is established.

Watermarking is essential for those images, which are exhibited in the court. They will ensure their authenticity and integrity. It should be done in all images being produced in the court as evidence as many counsels, rightly or wrongly, question the authenticity and integrity of these images.

Watermarking is also a valuable weapon to track manipulation of the images and to prove the ownership of the image and its contents. It is especially indispensable to prove copyright violations.

27.8 RECENT ADVANCES

A lot of research is going on in digital photography and significant progress has been made in the following aspects of digital photography:

1. Normal photographs can be changed into 3-dimensional photographs. They provide a better appreciation of the evidence. The tools and techniques, however, are costly and have, therefore, yet to become common.
2. Sensors have been improved tremendously. The dynamic range of one to one million is within sight.

27.9 ADDITIONAL READINGS

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CHAPTER 28

CELL PHONE FORENSICS

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Fig. 28.1

The Small Wonder
Crime-savvy Smartphones are sky rocketing Crimes!

28.1 GENERAL

Cell phone forensics is a branch of digital forensics. It is concerned with crimes involving a cell phone. It helps to recover digital evidence or data from a cell phone.

Cell phones possess personal information, such as contacts, photos, calendars and notes, SMS and MMS messages. Cell phone forensics helps to preserve and recover the evidence/data from the device observing scientific principles and legal formalities, without compromising the original evidence in the device.

Cell phone forensic experts often use a cell phone or PDA synchronisation software to "back up" device data to a forensic computer for imaging. Sometimes they process the evidence from the hard drive of a suspect computer.

Mobile phones have ushered in a new era in Digital Electronics not only in personal communications but also in the field of entertainment, music, and education. It is a low cost, low size, low weight device yet extremely powerful gadget for many applications. Because of its high portability, mobility, and mind-blowing versatility its use (and misuse) has spread and is spreading further like wild fire throughout the world. Sheikh Sade, a Persian poet, centuries ago, wrote a couplet in Persian:

Har keh bkamat Kehtar, Bkeemat behtar

(Anything which is small in size, is more valuable.)

Mobile phone has proved the poet's verdict "beyond any reasonable doubt"! Some of the superior models perform functions which were beyond even the imagination a few years ago.

28.2 NATURE

28.2.1 Cell Phone

A cell phone is a complex structure of many parts. The important ones are:

1. **Cell Body;** it houses the various parts and carries the screen and keyboard.
2. **Microphone and speaker;** they make voice communications possible.
3. **Microprocessor;** it handles the miscellaneous activities, of processing the information to perform the desired and the intended acts.
4. **RAM (Random Access Memory);** the software keeps the data created stored by the user.
5. **ROM (Read Only Memory);** it contains the Operating System (OS) software.
6. **LCD (Liquid Crystal Display);** it is used to see the text, images, numbers on the screen.
7. **Wi-Fi;** it facilitates wireless communications.
8. **A Radio module**; it converts the signal into radio frequencies which are relayed.
9. **Bluetooth;** it is mostly in advanced or smart phone only.
10. **GPS;** (Global Positioning System); it enables the person to get the location information of the call(s) and also helps in finding the travel route.

11. **Camera System;** most of the cell phone carry cameras now. They capture images and store them. They have been extensively used to collect covert information and images; for example, in pornography and sting operation. These images have provided devastating evidence in some cases against the culprits.
12. **Detachable Specialized Cards;** the detachable cards carry lots of information of varied nature. They have helped to crack many a case.
13. **PDA;** Personal Digital Assistant file is becoming popular in some smart phones. It usually carries important personal information.
14. Internal memory; it is usually flash memory of NAND or NOR type.
15. External memory; the common types are SIM cards and SID cards. MMC/CF cards and Memory Sticks are other external memory devices.

Newer generations of cell phones have more than one microprocessor. They carry out different functions independently and hence with far greater speed and accuracy. Most of the devices have different shapes sizes and functional protocols. Most of the software gadgets in cell phones provide forensically important information.

28.2.2 Functions

All cell phones, especially the newer models and the smart phones, perform many functions including the following:

1. Computer functions
2. Camera, photography
3. Music
4. Games
5. Calculator
6. Calendar
7. E-mail facilities
8. Internet web browsing
9. A dictionary, a thesaurus
10. E-banking, E-commerce
11. Television, Radio, Recorder
12. A watch. An alarm clock. In fact many persons have stopped wearing a watch. Most of those who do, do so only for its snob value (costly watch!).
13. A personal diary; a personal planner, manager, a reminder, a notes file
14. Potent advertisement medium
15. A public opinion collector on political social or religious issues
16. Data storage
17. SMS and MMS messaging
18. Map, safari, weather

19. Tunes incorporation
20. Various settings software
21. YouTube
22. LOCI (Location Information). Cell phone positioning from geographical data
23. Wireless Network Settings
24. Torch
25. Storage and transmission of personal and corporate information
26. Online transactions
27. Abuse by criminals in the commission of crimes
28. Law enforcement Use of cell phone in handling criminals and crime.

In short cell phone, a marvel of modern science and technology has come up as the most important personal gadget, for the common man, for connecting people, for music, for photography, and for games. For tech-savvy persons, it carries out many more functions routinely. It appears that it or its modified version, might make the laptop redundant or a "bulky" substitute in the coming times.

28.3 CELL PHONE FORENSICS

Cell Phone Forensics, a branch of Digital Forensics, is akin to Computer Forensics. It had to come! With so many uses, its abuses could not remain far behind. They have come in a big way. The cell phone has become a *prima donna*: both of the breakers of law and for the keepers of the law. There is hardly any crime of substance where it is not involved. Both, the perpetrators and he investigators, are using it to the hilt for their cross-purpose tasks. With the increasing number of cell phone crime cases, the demand for Cell Phone Forensics has increased and is increasing both in volume and complexity, exponentially.

28.3.1 Abusers

Almost all criminals misuse cell phone. The abuse is expanding, both volume and dimensions wise. Prominent abusers are:

1. Terrorists
2. Smugglers
3. Sex Racketeers
4. Drug traffickers
5. Saboteurs of all shades
6. Crime syndicates and mafias
7. Pornographers
8. Murderers, kidnappers
9. Illegal betting syndicates
10. Money Launderers.

The small cell phone has become a big boon to the organised crime syndicates. Its abuse by the criminals baffled the police and other law enforcement agencies in the initial stages. They feared that cell phone communication would give the criminal the upper hand. They will get the better of the law enforcement agencies. They were not sure how to deal with the menace. However, now the table is turned. This high tech honcho is helping them in a big way. Forensic scientists have come up with cell phone forensics technologies, which sometimes alone pin the crime to the criminal. They provide a web of information about the crime, the criminal, and the connected environment (men, materials, and situations) that it is not possible for the criminal to wriggle out of the net created by his cell phone.

> *In a recent murder case paramour of the wife and the wife were accused of murdering the husband. The clinching evidence of the killer bullet went against the accusation. It did not form part of the cartridge which had been allegedly fired by the paramour and whose cartridge case recovered from the murder site. However, the telephone contacts of the two accused at the material time placed the accused at the scene of crime site at the relevant time. The pair was convicted of the murder in spite of ballistics evidence supporting their innocence; the court mainly relying on the telephonic evidence. (CH)*

28.4 CELL PHONES EVIDENCE

The cell phones carry a lot of evidence. It must be located, collected, protected, and processed properly. It must not be allowed to get tampered, contaminated, mutilated, substituted, removed, or destroyed by the interested party, by the novice handlers or by the incompetent "experts". The cell phones suspected to carry evidence must be taken into possession (seized) at the earliest with all the required legal formalities, the evidence thereon saved and preserved with the utmost care and alacrity.

The wealth of information which cell phone provides includes the following evidence:

28.4.1 Contacts list

The cell phones have a list of persons (contacts) of the owner or user culprit. Usually, the persons are his colleagues, friends, relatives, business partners or acquaintances. The list may be long or short depending upon the number of contacts of the person (criminal) and also on the capacity of the cell phone. The social background of the contacts provides the social background of the suspect. It is possible that the list may carry the name of the co-culprits who were partners in the crime.

The check on the contacts has been very useful most of the time.

28.4.2 Call Log

Most of the cell phones today have a call log register. It retains all the important information about the calls received, missed or made. The call log of a cell phone reveals who the suspect owner has been contacting at various points of time.

The storage capacity of the cell phones varies.

The information which can be extracted from the call log register includes:

- The phone number of the caller or of the called.
- The name of the person concerned with the call, if the contact list has the name and the number.
- The number of the time the call was made or received.
- The date and time of the calls.
- The duration of the call.

28.4.3 Messages

The message software of cell phones is programmed to receive and to send messages. The messages give direct evidence about the nature of the goings-on *via* messaging.

The message software has the following compartments:

- Platform for writing messages
- Inbox for messages
- Inbox for E-mail
- Draft store
- Outbox
- Sentbox
- Broadcast messages

All the above may have important crime-related information.

The retaining capacity, the maximum number of messages a cell phone can hold at a given time, varies. Both incoming and outgoing messages are retained in the software sites called inbox and outbox. The messages often carry important information:

- Text of the messages.
- Phone number and the name of the sender if the latter is already in the contact list of the recipient cell phone.
- Date and time of the message.

If the number of messages goes beyond the capacity the excess is wiped off automatically. The last message (the oldest one) is wiped off first and then the second last and others in that sequence.

Further, the inbox messages can be destroyed by sending additional excessive (more than the retaining capacity of the seized cell phone) messages from some other phones. It must be prevented as suggested elsewhere.

28.4.4 GPS Software

Some cell phones come with GPS software. The software has the information about the movement of the user. It also indicates the time when the user was at a particular place. Thus, the GPS can, therefore, connect the user with the crime scene and indicates the time when he was at the scene.

28.4.5 Other Data

The cell phone carries other useful data which is provided by:

- **E-mails, received or sent;** the E-mails may reveal the accomplices, the location of the crime scene, action plan, the disposal site of the incriminating articles and the escape plan.
- **Photographs;** they may be of men, materials or places. They may be related to the crime being investigated and thus provide links between the user and the crime.
- **Calendar;** it gives the idea about the activities of the immediate past and of those which the user had planned for the future. The information therein can link the user to witnesses, instruments of crime, places and time of the activities.
- **Notes:** the user may be using the cell phone as a notebook (diary) to record notes on various matters, meetings, places and events, partners in crime and their addresses. The notes, thus, can be useful source of information in criminal investigation, if available.

- **Web Browsing**
- **Cell phone's IMEI (International Mobile Equipment Identity), ESN (Electronic Serial Number):** they are the identification data of the phone. They fix the identity of its owner, when the IMEI and ESN are known.

28.5 EVIDENCE SOURCES

The following parts of the cell phone carry the evidential data. They are checked routinely for information on the cell phone:

1. SIM Cards
2. Memory cards
3. Wireless network settings
4. Smart phone "apps"
5. Internet media
6. Handset
7. Web Browsing
8. Service provider

28.6 CELL PHONE FORENSIC PROCESS

Cell phone forensic process involves the following main tasks:

- Seizure. The investigator carries out this important work.
- Acquisition. It is a highly sensitive and delicate task. A qualified and experienced cell phone forensics specialist handles the task.
- Examination and analysis. The cell phone forensics laboratory staff examines and evaluates the acquired data.

28.7 SEIZURE

It is the work of the investigator. It involves location, collection, preservation and dispatch of the evidence to the Forensic expert. It is **P**ractical **P**olice **W**ork (**PPW**), carried out by law enforcement agencies or by private investigators. The success or failure of the investigations and trials depends upon these basic processes. They generally follow the general crime investigative pattern, yet because of the high complexity of the technology, miniature nature of the device, and delicacy of the device. It needs some special treatment and additional care in the handling of the evidence to save the evidence from deletion, destruction, contamination, mutilation, or even substitution. It is essential that the investigating officer understands the basic principles and follow a set protocol to get the maximum and correct information to ensure successful investigations.

28.7.1 Basic Principles

1. Cell phone is an ingenious marvel of technology. It does not brook fiddle with it. Neither the investigator fiddle with it nor allow anybody to do so. The wealth of information on the cell phone can get lost, contaminated, or substituted. Remember the seized cell phone should remain

"as is, as it was".

2. Cell phone has delicate software. It is prone to damage if exposed to static electricity, magnetic field, excessive heat, moisture or severe shock. They must be avoided while collecting, packing, transporting or storing the cell phones. Pack the cell phone in antistatic plastic or paper hard containers. The cell phone should not rattle in the package.
3. The identity (*vis-a-vis* the crime), authenticity, integrity and continuity of the chain of possession of the evidence seized must be beyond reasonable doubt, through proper documentation. Proper inventory on the label tag and properly secured package of the evidence goes a long way to maintain the identity of the cell phone (or other evidence).
4. All actions (seizure, processing, movement relating to the cell phone, storage) taken must be properly recorded for later verification if required.
5. Cell phone also has volatile memory. It is deleted when the cell phone is put off. The volatile memory needs preservation before the device is switched off. It is either "saved" or copied to computer or other electronic storage device.
6. The Cell Phone Forensic evidence is new to India (not so new now). An average investigating officer has neither the basic knowledge nor the training, nor practically any practical experience to perform the tasks of handling the scene, the evidence or to process it. It needs a competent cell phone Forensic Analyst. The investigations, therefore, needs **S**pecial **I**nvestigation **T**eam (**SIT**) to ensure proper investigations. SIT should consist of:
   - **Chief Investigator:** He is the team chief. He should be an experienced police officer. He will have the overall responsibility to assemble the desired team, assign duties to the team members and oversee that the team, individually and collectively performs their duties efficiently and competently. He writes report on the examination of the scene of occurrence after completing the examination of the scene.
   - **Documentation Officer:** He has to be a technician of high order to document the work done at the scene. Photographic coverage of the scene and the evidence thereon is his main task. Preparation of a site plan [sketch(es)] of the scene including evidence thereon and recording the scene and the evidence may be his additional duties.

     Sometimes the services of a draftsman are requisitioned for preparing the site plan, especially in expansive and important scenes.

     Textual recording of the scene is usually done by the chief investigator himself.
   - **Cell Phone Technician:** Seizure of a cell phone needs some technical considerations. It is essential that a competent technician, well-versed in cell phone technology, guides seizure of the cell phone. If the cell phone is switched off, it needs no action at the scene. It is collected like other evidence. If the cell phone is "'**on**", it needs special treatment so that the evidence thereon is not lost. The technician has to guide whether the cell phone is switched off, the battery is taken out or it is carried in Faraday cage (bag). The cell phone technology of the crime cell phone determines and dictates the safety measures in the collection process.
   - If there is something on the screen it is photographed before further processing.

- If the technical staff of the company manufacturing/servicing the device is available, their services should be obtained for the best results. Nearby outlet of the device should invariably be located, checked and services requisitioned whenever possible.

7. **First Police Officer at the Scene;** the first police officer reaches the scene post haste so that the evidence thereon is not lost, stolen, contaminated substituted or destroyed. It is not always possible for the designated investigator or member of his team to reach the scene immediately. Yet, the scene needs the immediate presence of a police officer. One is, therefore, dispatched at once on receiving the call. He reaches the scene immediately and takes over the responsibility at the scene. He performs the following tasks, keeping strictly in mind the integrity of the evidence:
   - Gets the scene vacated.
   - Barricade the scene.
   - Save and preserve the volatile evidence as far as possible.
   - Assess the men and materials needs of the scene for proper handling and inform the SIT chief about the assessment.
   - Listens to the gossip going around relating to the crime.
   - Detain the suspects/witnesses
8. **Facsimile Evidence;** Duplicate of cell phone evidence is prepared for day to day handling.

   A technically correct facsimile of the cell phone contents is prepared and used in all processing.

   This will keep the evidence in the cell phone intact.

28.7.2 Seizure Action Protocol

The action protocol for the SIT team is planned, guided, controlled and monitored by the chief investigator. He takes over the scene from the first police officer at the scene. He takes a round of the scene and checks the first police officer's assessment relating to the needs of men and materials and augments it if found necessary. He, then, takes steps to:

1. Document the location of the scene through video, still photography, sketches and descriptions.
2. Record the condition of the evidence and condition of the place of recovery. In some cases the cell phone may be found damaged, dipped in some fluid or buried under ground. The cell phone technician may stop further damage or resurrect the device as much as he can, carefully to avoid adding to or destroying the still existing evidence thereon. Anything done to evidence at the scene (or elsewhere) must be recorded.
3. Document the evidence, being seized, collected and packed, including the cell phone, in the same way.
4. Ensure that the evidential value of the digital evidence (or other evidence) is not compromised in the collection, preservation and packing processes.
5. Photograph the visual on the cell phone screen.

6. Take the cell phone into possession in the presence of witnesses, observing all legal formalities as in the case of other evidential clues. Preserve, pack, transport and store the evidence in such manner that its identity, integrity, authenticity and chain of possession are not compromised.
7. Seize the associated equipment and accessories connected with the cell phone: connecting cables charger(s), power adapters, media, (U)SIM, and other evidence relating to the phone should be collected from the scene.
8. Seize laptop or personal computer of the suspect. They may contain excess data from the cell phone stored therein.
9. Locate, collect, and seize detachable accessories (memory cards, (U)SIM). The cell phone technician will be able to identify them. The team members should also be familiar with the various detachable parts.
10. Ensure that the volatile evidence is collected, preserved, or recorded immediately and properly, if the cell phone is **"on"**.
11. Check the cell phone for extraneous evidence (fingerprints, blood or perspiration stains or dirt). Collect the evidence. These traces may link the abandoned cell phone to the user.
12. Preserve the evidence (the varied data) on the phone. The data can be deleted, overwritten or replaced by remote control devices (telephony!). Save it:
    - Ask the service provider to disable the service to the involved phone, immediately.
    - Put the cell phone in a **"Faraday cage"**[1] or in a radio frequency isolated container. It prevents the radio rays to reach the cell phone from outside and thus it will not be possible, ordinarily, to tamper with the cell phone data with remote control.

Fig. 28.2
A simple Faraday Cage

1. It is a device to keep off the incoming calls. It is also known as Faraday Cage (bag).

- Switch off the cell phone. The process washes off the volatile memory.
- Remove the battery of the cell phone. Removal destroys volatile memory. It may also lock the phone.
- Place the cell phone in an area protected from radio rays. The created area may be in a scene of crime vehicle or an area at the Analyst's laboratory.
- Use radio jamming or spooling devices are to shield the cell phone from remote control including outside phone contact.
- Trick the handset by using (UMITS)SIM (Universal Mobile Telecommunication System) Subscriber's Identity Module]. This module substitute action for the real SIM card. The original contents will thus be saved. The trickster, (U)SIM, can be used anywhere.

All these methods have their limitations. The seasoned cell phone technician understands them and adopts the best mode to save the evidence. Removal of battery, if the cell phone does not get locked on removal, is the best mode.

13. In case the correct method could not be determined, requisition the services of the expert immediately from the manufacturer or from the departmental digital data Forensic laboratory. Most of the Forensic Science laboratories have now digital evidence evaluation units, though most of them have limited facilities/ competencies.
14. Obtain the password and other security code, PIN. The suspect may or may not give the same.
15. Collect the IMEI (**I**nternational **M**obile **E**quipment **I**dentity) and ESN (**E**lectronic **S**erial **N**umber) identification data of the cell phone for its identification. The data may lead to the owner in case the cell phone's owner is not known (when it is found abandoned or left at the scene or elsewhere).
16. Preserve, store, transport and handle the evidence on the cell phone using methods and modes which do not compromise the authenticity, integrity, chain of possession, and legality of the evidence.
17. Note down the technical specifications of the cell phone if they are available without disturbing the cell phone settings and disrupting other data. They may indicate the technology (power) and possible contents of the cell phone.
18. Collect the relevant papers, files and brochures found at the scene. They might reveal useful information.
19. Record:
    - Who seized, collected, packed and sealed the evidence? He must be legally competent to do so.
    - What was the condition of the evidence when it was found?

IO's Drill

1. Call in the cell phone expert to the scene at once.
2. Let the expert handle the technical aspects of the evidence.
3. Fix the identity of the phone through photography and documentation.
4. If the cell phone is '**on**', collect, preserve and record the volatile evidence immediately through the expert.
5. Use Faraday bag/RF-shielded box, RF-shielded room for network isolation of phone.
6. Take out the SIM card photograph, document it and prepare a its clone
7. Prepare a Clone of the SIM card (with expert help). Use the clone in place of original in all day to day work
8. Get both logical and forensic extraction from the cloned SIM through extraction and analysis tool with expert help.
9. Parse and examine the data from physical extraction and co-relate it with case.
10. Create images for the various file types or strings of data. (with expert help) and sift the case connected data
11. Prepare a report of the relevant findings
12. Co-relate the findings with other evidence in the case
13. Handle the non-SIM devices through an expert:
    - Consult manufacturer whenever possible
    - Do physical extraction of the cell phone device and examined the parsed extracted data.
    - Extract data from the logical examination

Prepare files from raw images of various files

28.8 PHONE FORENSICS ANALYST

The basic work of the cell phone forensics analyst is to identify the phone in respect of its make, model, service provider, and the user or owner of the phone and to examine and evaluate the contents of the given cell phone.

28.8.1 Identification of the Cell Phone

It is identified from:

1. IMEI (**I**nternational **M**obile **E**quipment **I**dentity)
2. ESN (**E**lectronic **S**erial **N**umber)
3. ICCID (Integrated **C**ircuit **C**ard **Id**entification **N**umber)
4. Manufacturer's label (It carries make and model information usually) and Logo. The information is usually found in the base of the battery cavity.
5. If the phone number is known, service provider can be found. He furnishes a lot of information about the identity of the cell phone.

6. The pattern of settings and filing system of a cell phone is different in different models or makes. The patterns indicate the make and model of the cell phone.

There are websites which give detailed data, photographs about different types of cell phones. They are helpful in the identification. They should be consulted whenever there is doubt about the identity of the cell phone.

If the maker of the cell phone is known, his Website should be checked for information. It will carry detailed specifications and information on various features of the phone.

28.8.2 Retrieval of Contents

All relevant contents of the cell phone are collected and their electronic (and hard) copies are prepared.

28.8.2.1 Retrieval of the Deleted Text

There may be some deleted text from the cell phone which may be important. It isresuscitated, whenever possible.

28.8.2.2 Identity of the Contacts

The identity of the contact should always be checked personally whenever possible or through the phone number available on the seized phone.

28.8.2.3 To and Fro Calls

To and fro calls' information has helped to solve many a crime. These calls can provide information about the contacts. The frequency of the phones to a contact leads to the part played by the contact. In addition, calls indicate:

- the places from where the calls were made through GPS evaluations Thus, many criminals are placed at the scene through the calls.
- the date and time of the contact help to connect the caller and the called
- duration of call(s) often fixed the intimacy of the caller and the called.

28.8.2.4 Exchanged Messages

The contents the exchanged messages can provide important information about the crime being investigated. It should be seized.

28.8.3 Additional Problems

During the handling, examination, evaluation and analysis of the seized cell phone, the major problems which crop up are:

1. How to get at the Password, especially if it is biometric or visual login?
2. How to power the cell phone during collection, transport and storage especially when it is in sealed packet?
3. How to detect, get rid of malicious virus intentionally inducted in the cell phone to prevent extraction and analysis of the data in the cell?
4. What are the best mode(s) or equipment (software) for the extraction and retrieval of data on the given cell phone?

5. How to connect the cell phone to a PC to transfer (copy) the data for detailed study?
6. How to open a locked SIM? (Password?)
7. How to operate a biometric password if the suspect user does not cooperate?
8. How to handle a cell phone carrying malignant program introduced by the abuser to mislead the analyst?
9. How to correct the tampered key command buttons?

These are technical problems. The solutions vary with different brands and models. A seasoned cell phone forensics analyst is able to handle most of them, most of the time. In refractory cases he, however, requisitions help from the cell phone's manufacturer or his agents.

It is always desirable to get the help of the technical staff members of the manufacturer. They know all about the cell phone or can get the information. Further, they assist the investigator to ensure the safety of the evidence on the phone, when the investigating team has no competent Forensic analyst to handle the evidence. They also help the investigator to:

1. Locate and collect extraneous evidence.
2. Render the evidence 'safe' from remote control changes in the phone when the cell phone in "**ON**".
3. Lead the investigator to the owner of the cell phone by providing identifying data of the phone:
   - IMEI
   - ESN
   - Cell phone manufacturer and Logo.

The above information is bonus information to the one he provides after the complete Forensic examination.

28.9 FORENSIC PROCESS

The Cell Phone Forensics starts with the seizure of the cell phone. The first step of the analyst (or of the cell phone technician) is to save the volatile memory from automatic purging, malicious software and external remote attack. The second important step is to ensure the safety and integrity of the data in the cell phone. The third step is to acquire (retrieve) the information/data in the cell phone. The process is called acquisition. It prepares a duplicate (partly or wholly) of the contents in the cell phone. The last step of the analyst is to examine and analyse the retrieved data to fix the identity of the cell phone, to find evidence of a crime, to identify criminal, and to link him with the crime. The analyst uses the best duplication tools and techniques to extract the data on to a blank unused cell phone, computer, or other storage media. He may prepare more than one duplicates of the digital data in the cell phone. The work is carried out at an electronically safe place with modern tested and reliable gadgets to ensure safety/integrity of the original data and to achieve complete acquisition of the relevant data. The last step is to examination and analysis of the data. In the handling process he takes care to:

- Safeguard the integrity of the original contents: no contamination, no mutilation, and no destruction.
- Prevent virus entry into the phone.
- Prevent interference into the contents through remote control
- Label the retrieved data properly for its identity.

The original digital data is not used for day to day work. Its duplicate is prepared and used for examination and analysis. Thus, the original data in the cell phone remains intact.

The analyst job is formidable; many brands in the market, with diverse technologies, volatile nature of some data and induction of corrupting viruses are his big headaches.

Standard recovery principles

(for cell Phone Evidence)

1. Consistency with legal systems
2. The Forensics analyst handling the cell phone evidence has Forensics competence.
3. During/after seizing digital evidence, actions taken should not change the original evidence.
4. Only the person, forensically competent, should access original digital evidence; it is necessary to do so.
5. Documentation of all activities relating to the seizure/access/storage/transfer of digital evidence must be fully documented, preserved, and made available for review, if required.
6. An individual is responsible/accountable for all actions taken with respect to digital evidence while the digital evidence is in their possession.
7. The laboratory undertaking the work is accredited
8. Validation of tools, techniques and training in them exists.

28.9.1 Cell Phone Forensics Analyst

Cell phone forensics analyst has to be exceptionally competent to handle ever newer technologies which are so varied and changing so fast! The analyst must have:

1. A basic thorough grounding in digital forensics.
2. Intensive and extensive training in cell phone forensics.
3. Ample work experience as an understudy with experienced cell phone forensic analyst.
4. An up-to-date laboratory with all the important tools to extract, duplicate the contents correctly and completely and to carry out other tasks relating to cell phone forensics.
5. A fairly extensive museum (collection) of cell phones, their accessories and acquisition tools in his laboratory.
6. Knowledge about the ever incoming developments in cell phone technologies.
7. Extensive liaison with the technical staff of the various manufacturers, cell phone technicians and fellow analysts; whenever possible.
8. Membership of the society of cell phone forensic analysts and participation in cell phone forensic meetings, workshops and seminars.

The day is not far when we may have to have different specialists in cell phone Forensics for different brands of cell phones or for different tasks in cell phone forensics.

Cell phone forensic evidence, as the name indicates, has to be presented in courts. The evidence, therefore, has to be court savvy. It must be:

- clear (unambiguous), concise, precise and easily intelligible.
- presented by a competent professional, with proper basic education, training and experience.
- Based upon accepted and verifiable scientific principles, tools and techniques.
- The chain of custody of the evidence must remain intact (unbroken) from the time of the seizure to the time of production in the court. It is kept in a logbook. The handlers of the evidence must ensure the continuity of the chain of possession of the evidence:

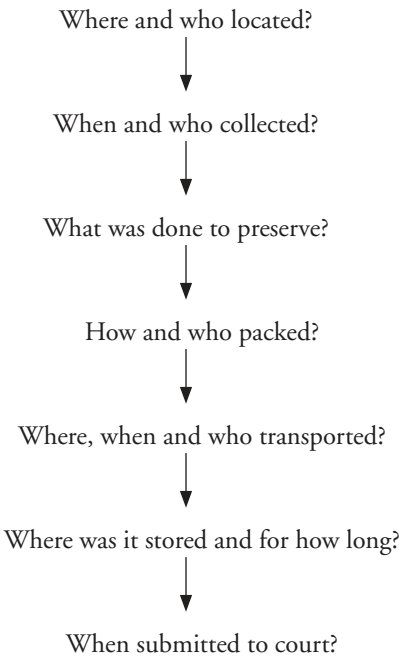
Where and who located?
When and who collected?
What was done to preserve?
How and who packed?
Where, when and who transported?
Where was it stored and for how long?
When submitted to court?

Fig. 28.3
Chain of possession

28.9.2 Acquisition

Acquisition is the acquiring (extraction, retrieval) of data from the cell phone and similar devices and media through photography, imaging or reading. It may be done at the crime scene or elsewhere. However, a cell phone forensics laboratory is the right place. It has better equipment facilities.

Acquisition is the most important technical step. It is simple mental and manual labour in most of the cases. In some cases, however, it often amounts to research (a new model) where new technologies have been used. Liaison with the manufacturer, his agents, or dealers help.[2] They know the new software and hence can help.

2. Acquisition tools and the processed are highly technical and are changing every other day. They have been just mentioned. They need not be understood by the investigation, the counsels and the judge. The analyst has to dive into the original current literature.

28.9.3 Acquisition Tools

The acquisition of data from a cell phone was manual work in the initial stages. Each item of information on the phone was brought on the screen, studied and relevant data photographed for record, for future re-examination or for presentation in the court. The information collected was usually Contacts Lists, Call Logs, SMS, MMS and the cell phone identity data (Maker's name, Logo, IMEI, and ESN).

The method had disadvantages. *Firstly*, all the information in the cell phone could not be reached and acquired. *Secondly*, there were chances that some evidence may get mutilated or lost inadvertently. *Thirdly*, the evidential data could be obtained only in photographs. *Lastly*, the deleted data could not be retrieved by manual acquisition! It was a serious lacuna.

Soon after, acquisition software started coming up. They could retrieve data from a cell phone and copy it on to a corresponding blank cell phone or to a computer. More than one copy of the relevant data could be prepared for detailed study and evaluation by more than one expert, if so required. Software to retrieve the deleted data also started coming up. Now there are numerous softwares which retrieve the evidence in a cell phone.

The following considerations determine the selection of the software for the recovery of the evidence:

1. The software is compatible with the cell phone.
2. It has been tested and used frequently for similar acquisitions from similar devices.
3. It (and the technique) is recognized and accepted by the larger community of the cell phone forensic analysts.
4. The extractions are accurate, verifiable.

The main characteristics of such software are:

1. There is no universal tool which can extract data from all cell phones. Certain tools are brand-specific. They are very effective for the brand. They may prove useless for other brand cell phones.
2. The developments in cell phone technologies are so fast that acquisition ware becomes dated soon after launch. The competent and conscientious cell phone analyst is always on the lookout for the new developments and keeps himself with the top Joneses so that he can handle the latest editions of the cell phone effectively.
3. Particular software may recover most of the data but it does not recover all the data. Consequently, the analyst often uses more than one software to maximise recovery of the deleted or undeleted data.
4. They are time and cost effective.
5. They cause minimum damage to the data, stored in the cell phone.
6. They are mostly commercial and proprietary items in nature.
7. They are mostly automatic.
8. Usually new tools are needed for new updated cell phones.

There are numerous specialised tools with fancy names. But the modifications are so fast that one has to check up the WWW to find the correct hardware and software tool for the given device.

BOUNDARY SCAN is one which is proving quite handy these days. JTAG (Joint Testing Action Group) developed. It is the tool which copies both the volatile and non-volatile memory, though the time taken for imaging is long usually. The technique is not of universal application.

De-soldering of the memory chip, for non-volatile memory, is another mode to extract memory data on the chip. The memory chip thus removed from the cell phone is attached to the memory reader and contents collected. The memory chip is re-soldered to the phone. The process can damage the chip and mutilate its contents.

The tools for extraction of evidence are legion. Among them, the popular ones are:

- **Access data,**
- **Sleuthkit,**
- **EnCase.**

The details of various tools and techniques to extract the data from the memory repository are beyond the scope of this book. Some of the important names of the current acquisition tools and techniques are:

- Hex editor
- Micro systemation XRY
- Access data MPE
- Radiotactics
- Oxygen Forensic Suite.

28.9.4 Acquisition Processes

The acquisition modes of cell phone contents vary. The current ones are:

- Manual Acquisition
- Physical Acquisition
- Logical Acquisition
- External Memory Acquisition
- Internal Memory Acquisition
- File system acquisition
- Brute force acquisition

28.9.5 Manual Acquisition

The manual retrieval of digital data, as already seen, is the simplest and the first mode used for the recovery of contents in the cell phone. The cell phone contents are brought on the screen, item-wise, one by one, scrutinised and the evidentially important data is photographed. The retrieved evidence is in the form of photographs which can be understood and appreciated by all concerned. The acquisition mode has certain disadvantages.The manual acquisition mode is used rarely; usually where the workload is limited and retrieval software is not available. Or, some evidence is not amenable to automation. Use of videography, however, to record the screen images, one after the other, has come handy for detailed study and presentation of the evidence on the cell phone.

28.9.6 Physical Acquisition

In physical acquisition, the Forensic Analyst uses high tech software to extract digital data from the cell phone. The software retrieves the entire data directly from the memory (flash memory), part by part, and copies it on the desired format (computer or blank cell phone).

Physical Acquisition software can also extract deleted files as well as the remnants of the deleted data.

28.9.7 Logical Acquisition

Logical acquisition is used to retrieve evidence from logical stores (directories, files). The process copies the stored files and directories in the logical store, one by one directly on to a computer *via* the manufacturer's interface provided for synchronising the contents of the phone with the computer.

Logical retrieval can resuscitate only those deleted files which are marked deleted and are not overwritten.

28.9.8 External Memory Acquisition

External memory software may have mainly cards. Thus we have SIM, SD, MMC and CD cards. In addition, there is a memory stick. The memories are locked via a switch present in the cell phone at the earliest to prevent changes in the same. External write-blocks are also available to prevent changes in memory.

The contents of the external memories can be easily copied through software (card reader) developed for the purpose. In some, the memories can be copied directly on to a computer without software.

It is possible to read deleted files in the external memory devices.

28.9.9 Internal Memory Acquisition

Acquisition of the internal memory (mainly Flash Memory) is the toughest nut to crack. There are a number of tools. For example, system commands are used to extract information. They are also used to retrieve volatile memory.

Flasher tools are another category of tool wares that can extract memory (Flash memory!). These tools are mostly available with the manufacturer and are useful for their brands.

28.10 ANTI-FORENSIC SOFTWARE

Manufacturers are inducting stringent safety measures increasingly to protect the contents of their cell phones. The safety software is being introduced in the memory cards. For example, biometrics passwords, visual login, token-based entry, malicious programs, faulted key functioning, remapping the card controlling the functioning are all anti-forensics, creating problems. These additions are obstructing the extraction work of the analyst. However, liaison with the company can solve the problem in most of the cases, in addition, advances in analytical cell phone technologies are providing fair tools to meet the challenges.

28.11 SERVICE PROVIDER LOGS

Service provider's log carries a lot of useful Forensic information about a cell phone to which he provides the services. It gives the section area, keeps the account, bills the customer and its tower provides the interface. It can provide a lot of information including:

1. Calls characteristics: the number called, time, place, date, duration of the call.
2. The number of times the number was called with time and date.
3. The location of the phone.

28.12 EVIDENCE PRESENTATION

The words of an expert are no longer sacrosanct and the gospel truth. Nobody accepts the *ipse dixit* of the expert. His report, therefore, in addition to being precise, concise and intelligible must:

1. Give the referral data (FIR with dare/place, reference letter no, Report No. with date and specialist's signature, name, designation).
2. Give the gist of the work done, along with illustrations and relevant images to support the findings.
3. Mention the tools and techniques used, quote or give references to show that they are generally used and accepted by the forensics community.
4. Emphasise that the tools and techniques used are recognised and accepted for the type of work done with a known margin of error.
5. The data presented is adequate to support and prove the given conclusions and accepted by the expert fraternity.
6. Use lucid language.
7. Use data, illustration, photographs and citations to convince the court.

28.13 ADDITIONAL READINGS

1. Wayne Jansen & Rick Ayers, *Guidelines on Cell Phone Forensics,* NIST, USA, 2014.
2. Wikipedia, *Mobile Device Forensics*, Wikipedia, The free Encyclopedia (Internet), 2011.
3. Lessard, Jeff, and Kessler, GC, *Android Forensics: Simplifying Cell Phone Forensics,* Small Scale Digital Device Forensic Journal, vol 4, No. 1, 2010.

CHAPTER 29

VOICE RECOGNITION

SYNOPSIS

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29.1 GENERAL

"Person authentication by voice: a need for caution."[1]

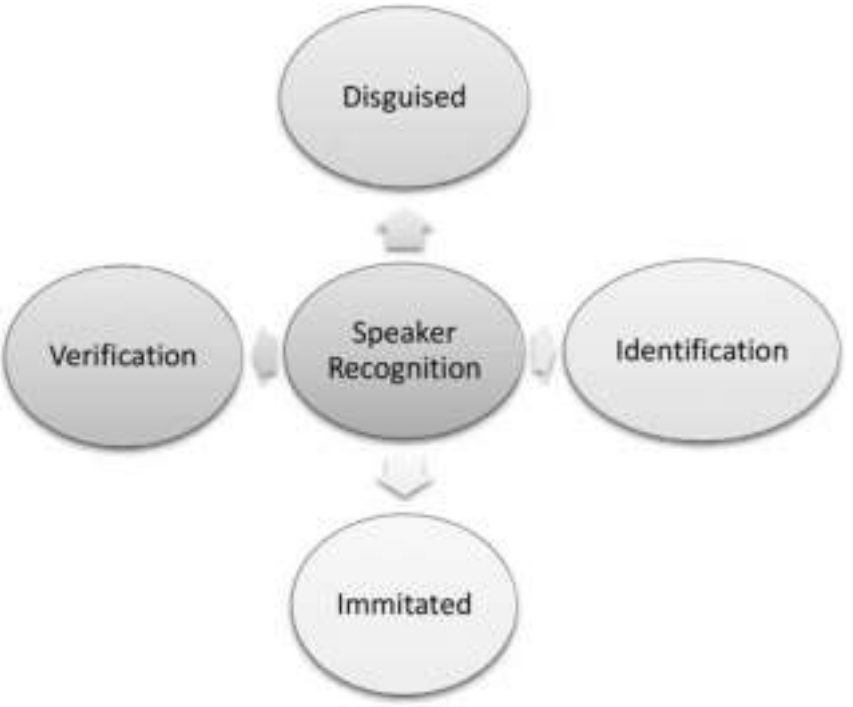

Fig. 29.1

Human beings, as well as animals, produce sound. The former can articulate the sound to produce and create a language through which they communicate with one other. The animals cannot articulate their sounds and thus are unable to create a language of their own. The capability of the human being for the articulation of the sound distinguishes him from the other species.

The voice of a person (as well as that of an animal) is unique, personal and non-imitable in its entirety because each speaker has his or her characteristic manner of speaking, including the use of a particular accent, rhythm, intonation, style, pronunciation pattern, choice of vocabulary. In addition, the structures of vocal cord, throat, and mouth vary. Under normal circumstances, therefore, the voice can permit recognition[2] of the speaker, most of the times. The voice communications were possible among the persons who were within hearing range, and they could identify each other from their voice. Most of the time, they could see each other and hence identify the speaker visually. The modes of voice communications have changed drastically in the last hundred years or so. The communicating persons need not be within the hearing range nor they need visual observations to identify the speaker, facing one another or be present within hearing range. They can be anywhere in any part of the world, in the sky or

1. 8th European Conference on speech communication and technology, Geneva, 2012.
2. Recognition includes both identification and verification of the speaker.

even under water, yet they can talk to each other. This has been possible through the extensive development in voice communication systems including the following:

1. Telephones
2. Wireless telephones
3. Satellite telephony
4. Mobile phones
5. Tape, wire and disc recording and playing the recorded version is common. The modes of recording voice (cassettes, floppies, and discs) are becoming legion and increasing.
6. Notebook, Laptop, Computer and Internet communications are the order of the day.

The criminal has seen the possibilities for misuse of the various modes of voice communications, believing that he will remain *incognito*, and thus nobody would see and identify him. It is fortunately no longer true. The voice can identify him and pin the crime on to him usually in all normal cases.

Voice identification has been practised from time immemorial. It was first used to identify the voices of birds, beasts and wild animals. In addition, the voice was and is used to identify our kith and kin as certainly and as correctly as by visual observations. The problem arises when the voice is disguised or imitated; or, it is the unfamiliar voice of a stranger or, in some cases, it is a recorded voice.

> *The misuse of an imitated voice for criminal purposes is mentioned in our sacred mythology 'Ramayana'. When Lord Rama left to hunt and catch the golden deer, goddess Sita heard her husband's voice, calling for help. Mareech, Ravana's agent, imitated the voice. Sita forced Lakshman to the scene. It facilitated abduction of Sita. (CH)*

Numerous hurdles, including the following, obstruct voice identification:

1. **Intra-speaker Variations:** There are always inter-speaker variations. Simultaneously, there are intra-speaker variations also which hinder feature selection of the voice. The normalisation of the identifying features is now routinely attempted to secure better verifications.
2. **Disguise:** The identification of birds, beasts or human beings by voice was primitive but it was quite effective. There was (is) no disguise in their voice. Humans, however, can disguise their voices. It is often difficult, if not impossible, to identify or verify the speaker when the voice is disguised. There are numerous modes of disguising the voice, including the ones given below:
   - The outgoing sound is partially obstructed; for example, covering the mouth is covered with cloth/paper
   - Mimicking the voice of others; to hide one's own voice
   - Speaking with food or other object in the mouth; the mode can be quite effective with the right object and some practice
   - Closing the nostrils; the sound characteristics change considerably
   - Adopting some dialect with a different accent
   - Using electronic voice changer (gadget)

Identification of human voice through listening still continues. Both the lay and the expert witness gives evidence on the basis of the aural evaluation of the voice. But now almost in all cases, instrumental evaluation (sound spectrography) is also produced. Instrumental methods are useful and handy but they are not infallible, as one would wish them to be.

In fact, the instrumental evaluation has now taken the central stage.

3. **Age Effect:** It is elementary that in old age the loss of teeth has adverse effect on vocal envelope; bring in subtle changes in the voice. They are taken into account in speaker identification or verification.
4. **Health Effect:** The weak health or ailments bring in changes in voice like those due to old age. Obviously, the extent of change depends upon the degree of deterioration of health.
5. **Emotional Disturbance:** Extreme fear hatred, anger, shock affects voice. Their possible influence is considered while carrying out voice analysis.
6. **Miscellaneous:** In addition to the above, background noise, recording device noise, reproduction machine noise, mimicking, and other problems also affect.

29.2 IMPORTANCE

Identification of voice or sound has always been important. It is becoming increasingly more important when voice mode of communications have adopted analogue, digital and electronic mode for recording, storage, and transmission for all types of utterances not only in social, entertainment and business matters but in communications of the criminals *inter se* and with others (victims). Consequently, voice recognition is receiving a lot of attention. The voice scientists are busy to make voice communications secure and safe and to handle the criminal through voice recognition.

In forensics context, voice recognition is important for:

1. Identification of the criminal (speaker) from their telephone and other recordings; the identification (recognition) of criminals from voice is being used increasingly and effectively to identify criminals, group of criminals, conspirators, abettors and supporters of criminals. It is also becoming a potent weapon against corrupt politicians, officials and businesspersons.
2. Verification (authentication) of the speaker
3. Criminal's profile; it is being built from the utterances of a criminal. They are assuming great importance in fixing his place of origin, his social status and his mental and emotional personality. Forensic psychologists are doing a yeoman's job in providing the profile.
4. Determination of the integrity of the utterance recorded on various mechanical, electronic devices.
5. Enhancing the intelligibility of utterance.
6. Transcription and analysis of the disputed utterance.
7. Identification of objects or persons in the tape.
8. Authentication of audio tapes.
9. Identification of pirated cassettes, VCD, DVD, MP3 CD.
10. Enhancement or improvement of tape-recorded text wholly or partially.
11. Preparing authentic duplicates for courts and other purposes.
12. **Forensic Biometric;** it is the most revolutionary development pertaining to voice recognition in recent years. Voice is being used increasingly for authentication/ identification of individuals in banking industry and in online business transactions. Speaker authentication acts as a "gatekeeper" and allows transactions only after

verification of the voice of the account holder. It detects the fake voice if a person impersonates other's voice to commit fraud. In addition, it identifies the fraudster if he happens to be on the roll of the system.

Speaker recognition is pattern recognition. Spectral patterns (features) are used in representing speaker characteristics. The various technologies used to process and store voice prints include frequency estimation, pattern matching algorithms, neural networks, matrix representation, Vector Quantization and decision trees

Ambient noise levels can impede both collections of the initial and subsequent voice samples. Noise reduction algorithms can be employed to improve accuracy, but incorrect application can have the opposite effect. Voice changes due to ageing may impact system performance over time. Some systems adapt the speaker models after each successful verification to capture such long-term changes in the voice, though there is debate regarding the overall security impact imposed by automated adaptation.

Capture of the biometric voice is seen as non-invasive. The technology traditionally uses existing microphones and voice transmission technology allowing recognition over long distances via ordinary telephones (wired or wireless). Digitally recorded audio voice identification and analogue recorded voice identification uses electronic measurements as well as critical listening skills that a forensic expert applies for the identification to be accurate.

Voice biometrics, used in the banks, meet new regulations designed to protect individuals from identity theft and requiring higher levels of authentication/ verification. For example, US banks must provide three levels of authentication/verification in all over-network transactions. These higher levels must have answer to the question,

"Is this person the same person who he/she claims to be?"

The following three parameters are used commonly to find answer to the question:

1. Something the person knows; such as, a password or PIN;
2. Something the person has; such as, a credit card or token;
3. Something the person has (such as, a fingerprint, a retinal pattern,) which is used as a biometric.

Voice biometrics is being used increasingly in banks because of convenience. It provides a three-in-one solution for safe/time/cost effective banking.

The voice has been used as important clues in many types of criminal cases.

1. *In the Bombay bomb blast case of 1993, the main perpetrator, abettors and controllers were identified through telephone tapping and recording their voices. (CH)*
2. *In cricket match fixing, Hansie Cronje, South Africa team Captain, was fixed through telephonic conversations he had with bookies. (CH)*
3. *In the murder of a press reporter, the main organiser of the murder, allegedly a senior police officer, was identified through voice identification. (CH)*
4. *In the terrorist attack on Parliament, on 13 December 2001, the main organiser, a Prof. of Delhi University was identified through mobile phone tapping and recording his voice although the mobile recording was very noisy. (CH)*
5. *In spot fixing in IPL 2013 cricket the culprit cricketers were fixed through their identification from telephone conversation. (CH)*

Voice identification often plays a decisive role in the following types of cases:

1. Ransom cases, blackmail, threats, obscene calls, extortion, political or other intimidation
2. Bomb or fire hoax

3. Black box voice identification
4. Intelligence collections — identification of spies, saboteurs
5. Identification of drug dealers — manufacturers, smugglers, suppliers, distributors, peddlers
6. Identification of smugglers, their contacts, distributors and sellers of smuggled goods in the country
7. Identifications of terrorists, their partners, paymasters, supporters, and sympathisers; through their voice identifications and thereby finding proof against them
8. It is a potent weapon against the culprits who deny corruption charges. They claim a frame up. Voice recording overcomes the frame-up story.

   In a case, still pending in the court, the conversation of chief minister of a state and his wife with the persons who allegedly offered bribe was recorded. The chief minister denied the conversation, alleging it to be a frame-up. The report of the voice scientist did not identify the voice of the chief minister and his wife in the recorded conversation. (CH)
9. Involvement of individuals in planning and execution of murders and other crimes
10. Illegal deals in money, land or property, use of black money, transfer of money abroad illegally — *Hawala* (money laundering) transactions
11. Match fixing.
12. Soliciting — proof thereof.
13. Malingering — identification of the voice of the malingerer, which is recorded covertly.
14. Identification of the persons involved in organised crime.
15. Identification of pimps

    Once one of the gang leaders in Mumbai was identified to be talking to a film star, assuring the latter that his rival would be eliminated. The telephonic conversation was recorded and the voice of the involved persons identified. (CH)

29.3 NATURE

When we expiate air energy to create noise, we cause vibrations in the vocal cord and other related organs. They generate sound (voice). The organs involved in the creation of sound are activated to do so by the brain, the controller of human actions. The nature of the sound depends upon the number of organs involved, their dimensions (size, the shape), tissue density, elasticity and positioning. Important organs that modulate the voice are:

- Mouth
- Oral track
- Oral cavity
- Trachea
- Palate
- Tongue
- Jaw
- Tooth
- Lips
- Nostril

- Nasal cavities
- Larynx
- Pharyngeal cavity
- Lungs
- Diaphragm
- Oesophagus

Environmental voice source characteristics influence; bringing up of the person, education and many other factors influence. Emotions of the speaker also influence the utterances in many ways. The sounds produced by an individual, therefore, possess individual characteristics to form unique sound vibration patterns.

Voice analysis is mainly concerned with the identification of utterances made by a person while communicating with others. The voice of each person is unique because:

1. The vocal tract and other organs involved in the creation of the sound differ from one person to another.
2. The voice source characteristics involving mental, emotional and learning process and environment also differ with each individual.

If these sound organs are moved haphazardly, meaningless noise is created. If the sound is articulated, according to a system, it creates a recognisable voice in terms of word or other meaningful sounds. The articulated sound thus forms the basis of oral communication between human beings. Coded articulated voice is language.

Language is the creation of the following two functions:

1. **Phonation:** "Phonemes", acoustic signals, are created in this process.
2. **Articulation**: Phonemes are modulated to create intelligible words.

29.3.1 Phonemes

Phonemes are audible or even non-audible vowels and consonants. They are characterised by:

- Time domain
- Spectral domain
- Time and spectral domain

Articulation of the sound to intelligible voice (including words) occurs through tongue, lips, palate, teeth and the various cavities in these organs. As these organs have different dimensions, shapes and sizes, the articulations made by different persons are different. Thus, the sounds uttered by different persons vary. The main variants are frequencies and the dynamic range.

Pitch of the human sound normally has the following ranges:

For men	= 90 to 140 Hz
For females	= 180 to 300 Hz
For children	= 300 to 600 Hz

29.3.2 Variations in Voice

The human voice varies. Variations in human beings *inter se* are called inter speaker variations. They are due to many factors, both of organic and non-organic origin. We have already seen the variations due to organ variations.

Non-organic variations are due to:

1. Learning process of speech
2. Regional variations — influence of environment, dialects
3. Social structures
4. Educational level

The human voice also varies in the same person, from time to time. The variations are called *intra* speaker variations. In fact, no person can create exactly the same voice even with his best effort under similar situations, created one after the other. These variations are due to:

1. **Emotions;** they play an important role in speech variations. It is well-established that the psychosomatic effect can bring in changes in the voice even unintentionally. For example, when a person is asking for a ransom the fear of being caught affects the voice of the person. Likewise, when a person is giving specimen utterances, his awareness that it might bring him trouble can bring in a subtle change in the voice. The voice analyst takes into account such possible variations in his evaluations.
2. Rate of utterance
3. Mode of speech
4. Disease
5. Mood of the speaker
6. The emphasis given to a word at a particular moment
7. Physical discomfort, interference
8. Intoxication due to liquor or drugs
9. Age of the person

The success or failure of recognition of a speaker depends mainly upon:

1. **Inter-speaker variations of the voice**; it should be maximal. There is no measure developed for determining variability so far.
2. **Intra-speaker variability of the voice**; it should be minimal. It has not been quantified so far. Inter-speaker variations should be considerably greater than intra-speaker variations.
3. **The extent of the listening time** of the disputed voice
4. **The quality of utterance**
5. The efficiency of the recording and re-conversion instruments
6. The repetition of words
7. The time lapse between the two utterances; it should be minimal.
8. There should be no disguise. Unfortunately, there are ways and means by which the voice can be distorted considerably to create confusion in identification. There are devices and cell phones with such devices which can create (speak) different sounds
9. The number of possible suspects should be limited.
10. The sample utterances should be recorded, as far as possible, under similar conditions to those prevailing in the recording of the voice in the crime situations, using the same set of instruments whenever possible.
11. If voice has to be transmitted the transmission channel should be same or similar.

Kersta, who initiated voice identification technique was over-enthusiastic about the individuality of voice of each person and thought the voice remains unaffected with age, loss of teeth, tonsils. Likewise, he claimed that the attempts to disguise, mimic, ventriloquism and whispering, do not affect the identification. However, the claims were bare statement, without experimental data. The voice scientists do not accept them. Extensive research has been done to counter the inevitable variations and scientists have come up with techniques to minimise their effects. They are being used increasingly in crime situations.

Voice analysis involves certain terms (Speaker identification, Speech identification. Speaker verification/authentication, speaker diarization), which cause confusion and need elucidations:

1. **Speaker verification;** it is authenticating that the utterance is from one particular person. It is frequently used in certain security installations where the regular visitors have recorded their speech (limited volume) in a computer. When the visitor wants entry to the premises, he repeats the speech. The computer compares the two speeches. If they emanate from the source, entry is allowed. If they are from different source, entry is denied.
2. **Speaker identification/recognition**; it is the identification of the utterance of a speaker, from the utterances of a number of speakers. The problem crops up in ransom/threat/blackmail calls, obscene utterances.
3. **Speech identification/recognition**; it is to understand the contents of the utterance. In speech identification the contents of the utterance which may defy understanding due to external noise or changes in the sound are made intelligible. The need for evaluation of the speech may arise in some forensics situation the contents may incriminate or exonerate a person charged with crime. It may also reveal evidence which promotes better dissemination of justice by revealing secret or otherwise unknown evidence.
4. **Speaker Diarization**; it is identifying the same speaker in two or more utterances.

Speaker recognition systems have been classified into two main categories: available:

- Text-dependent and
- Text-independent

Text Dependent; in text dependent cases the disputed voice for verification and the exemplar (control) voice have the same word content. Here, prompts, a common password or phrase can be common for various speakers. In addition, passwords, PINs or knowledge-based information is employed for the broader database.

Text Independent.—Text-independent systems have exemplar and disputed voices in different text content. The subject may not even know that his voice is being used for forensic purposes. The identification processes are more laborious but they have the advantage that they require little, if any, cooperation from the speaker. They are, therefore, more frequently used in voice recognition.

In text independent systems, both acoustics and speech analysis techniques are used.

Speaker recognition is the major Forensic problem. It has also two sub-divisions: Speaker Identification and Speaker Authentication or Speaker Verification.

In the speaker identification task, a digital voiceprint of the speech utterance from an unknown speaker is compared with the voiceprints of known speakers. The unknown speaker is identified from the matching input utterance.

In speaker verification, the speaker claims an identity. An utterance of this speaker is compared with a standard utterance of the self-claimed person. If the match is above a threshold, the identity claim is accepted.

A high threshold rejects the identity of the impostors by the system, but with some risk of false rejection of valid users. Conversely, a low threshold enables valid users to be accepted consistently, but with the risk of accepting impostors. To set the threshold at the desired level of customer rejection (false rejection) and impostor acceptance (false acceptance), data showing distributions of customer and impostor scores are necessary.

In a sense, speaker verification is a 1:1 match where one speaker's voice is matched to one template (also called a "voice print" or "voice model") whereas speaker identification is a 1: N match where the voice is compared against N templates.

In speaker identification, the speaker speaks certain specified words, which are turned into digital or analog sound data. It is compared with corresponding data from the same text, already stored in a computer. If the data match, the speaker is identified.

Speaker identification devices are often installed at entry points, in security installation premises. The computer has voice data from all the authorised members of the staff and it picks up the right one from the many and 'passes' entry of the individual.

Speaker authentication is the same thing as speaker verification refers to the verification of the given utterance *vis-à-vis* a particular individual. His recorded voice is compared on 1:1 basis. If the identifying data matches, the identity of the speaker stands verified.

29.4 OPERATIONAL PROBLEMS

The operational problems in voice identification are many and varied. They are often inherent to the system and are tackled carefully. Some of the technical problems are:

29.4.1 Telephone Utterance

Telephone utterances are usually short in the actual crime situation. The criminal is often tense and due to psychosomatic effect, the voice is not normal. Further, the criminal may —

- Intentionally modify the voice
- Mimic the voice of some person
- Disguise his/her voice

The telephone apparatus and the recording device involved also affects:

- **Defective telephone apparatus**, voice recording apparatus or transmission device; they aggravate the voice identification problems.
- **Telephone systems reduce the frequency range** to 300 to 3400 Hz to record voice after filtering the human sound. Higher or lower frequencies in the voice are not available in the utterance for evaluations. It reduces the identification parameters considerably.
- **Transmission channel distortions**/modify sound.

29.4.2 Wire Tapping

Wire-tapping is frequently utilised source for recording the voice of the criminals covertly. The recorded voice is usually free from modifications, mimicry or disguise because the criminal does not know that his voice is being recorded. Again, the usual psychosomatic effect, present in threat, ransom or obscene calls is absent. However, if the person is under the influence of alcohol or drugs or has health problems, his voice may not be normal. The voice analysis may give erroneous results when compared with a normal voice. External disturbances (outside noises) at the recording site also affect the recorded voice and create difficulties in its identification. They make the recognition of recorded voice tough but do not inhibit it.

The operational blues of recording and transmission devices, however, continue, as in case of normal telephone calls.

29.4.3 Controlled Voice

Controlled utterance for evaluation and comparison with the disputed utterance needs vigilance. The investigator takes care to:

- **Collect sample utterances at the earliest;** passage of time may bring in changes in the health of the person that affect the voice and may increase the difficulties in evaluations.
- **Use the same (or similar) equipment** recording, transmission and reproduction; the devices have a great influence on the quality of the voice.
- **Create and record the voice under same (or similar) conditions**; whenever possible.

In spite of efforts to recreate corresponding conditions, certain lacunae remain. For example, the psychosomatic effect due to tension at the time of the commission of crime cannot be simulated.

29.4.4 Transmission Channel

In telephonic utterances, bandwidth frequency is changed to 300 to 3400 Hz. The voice, of higher or lower frequencies, is not covered. Likewise, dynamic range is controlled in telephone transmissions. The dynamic range available for voice recognition is, therefore, the recorded range only.

29.4.5 Miscellaneous

Other factors that create problems in the identification and comparison of voice are external noises, transmission rate *vis-à-vis* recording rate and the malfunctioning of the various devices involved in the process. The differences in the language used in disputed and controlled samples also create problems.

29.5 VOICE COLLECTIONS

The real voice recognition forensics involves mostly recorded voice. The major voice recording modes include:

29.5.1 Mechanical Mode

Thomas Edison gave us the famous gramophone (phonograph), a shellac disc which was the first gadget used to record voice. Later the material of the disc changed to wax or tin foil disc or tin foil drum. These modes of recording are now obsolete.

Vinyl discs replaced the above mode but they have also more or less vanished from the scene.

Motion picture audio track is also a mechanical mode. It is being used in cinematography. It is not used in non-cinematic recordings.

29.5.2 Magnetic Mode

Magnetic mode for voice recording succeeded in the mechanical mode. It has been utilised in:

- Micro Cassette Recorder
- Compact Cassette Recorder
- Reel to reel recorder

- Camcorder Analog Audio Recorder
- Video Tape
- Answering Machine

These voice recording devices are common and are still available in the market.

29.5.3 Digital Mode

Electronic mode of recording voice is the 'in thing', because of its superior quality. It gives life-like reproduction. This is the preferred mode and is being used increasingly in voice forensics. The following devices are useful:

1. Digital Audio Tape Recorder (DAT)
2. Digital Computer Cassette Recorder (DCC), Computer Disc Drive
3. Audio Recorder
4. Computer using tape drive back up or USB port removable chip
5. Answering Machines
6. Semi-conductor Memory, IC (Integrated chip) memory

29.5.4 Optical Mode

CD, CD ROM, CD-1 (interactive) CD-RC (recordable, CD-RW (rewritable) DVD (Digital Versatile Disc), and Mini Disc are the common devices in this category. They perform well.

29.6 EVALUATION

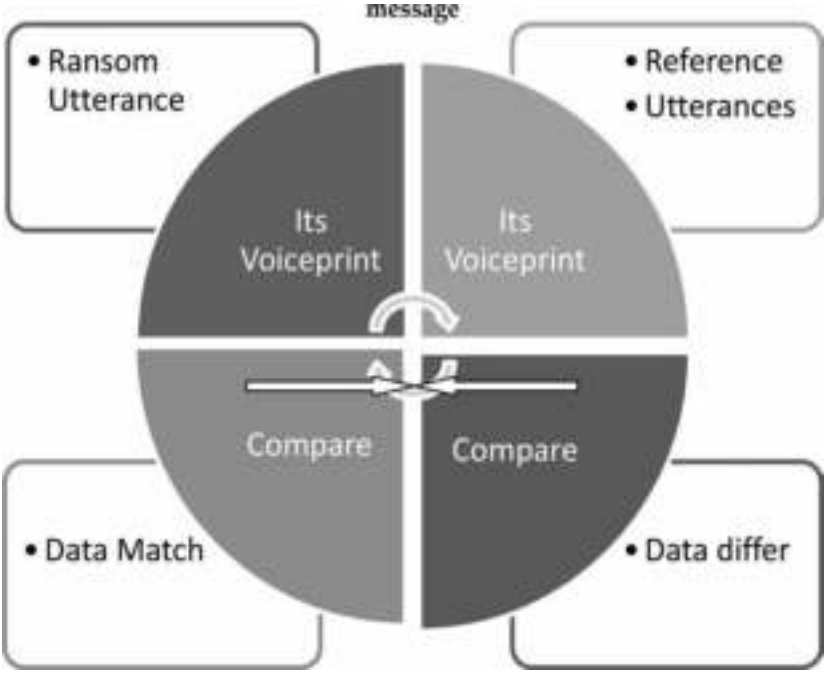

Fig. 29.2
Digital Voiceprint comparison

Voice recognition is done by three modes:

1. **S**peaker **R**ecognition through **L**istening (SLR) the voice directly or through instruments
2. Using instruments for voice collection, analysis and comparison of sound spectrogram (SRS)'
3. Combination of the two modes

In the first category, those individuals who have heard the disputed speech, as well as the specimen (ordinary), provide the evidence. The identification of the voice is highly subjective. Correct identification is possible only when the witness is familiar with the voice, and the speaker has not disguised or mimicked the voice. It is also possible if the voice of the speaker has some extraordinary identifying elements in the voice. In some cases, speech analysis (peculiar words, phrases, accent, and mannerism in talking) may help to recognise the speaker. It is rare. The factors affecting the identification of the speaker are:

- The ability of the listener for speech recognition
- The amount of utterance the person has listened to
- The familiarity with the voice
- The interval lapsed between listening to the disputed and the sample utterances. Greater the interval less reliable is the voice identification.
- The emotional conditions of the speaker, at the time of the disputed utterance, affect.
- The personal involvement of the victim creates bias.
- External noise confuses.

All of us recognise our near and dear ones through Speaker's Recognition Listening (SRL) day-in and day-out. Voice analyst also uses it extensively.

Speaker Recognition through Voice Spectrograms (SRS) are becoming more and more important as the techniques are being refined and their reliability of correct findings is increasing.

Automatic Speaker Recognition, through computers (ASR) is becoming the new tool of voice identification. There are numerous tools and techniques are being used and they are being improved continuously.

Usually, one does not depend upon one single method. Most of the laboratories doing voice identification combine the first and last techniques. Some voice analysts combine SRL and SRS.

29.6.1 Listening (SRL)

Laymen and experts both listen to the disputed and exemplar voice for recognition. Where identification of a familiar voice is concerned, the voice pattern image is already in the mind and the brain of the listener. It automatically recognises the pattern of the sound and quite correct identification is achieved in most of the cases. SRL, with an unfamiliar voice, is not so effective. However, voice analysts do acquire voice discrimination skill over time and can make fair judgments through SRL in many a case.

In crime situations, however, a familiar voice is rather rare. The nonprofessional has to identify a non-familiar voice most of the time. The expert has usually to deal with unfamiliar voices.

Listening is the first step towards voice evaluation. In some cases, it may permit the elimination of the suspect. If the pronunciation, accent, dialect, loudness or pitch differs drastically and simultaneously, there is no likelihood of possible disguise, the suspect could not be the culprit. The process of identification through listening adopted by the experts involves:

1. **Recognition of the characteristic feature**; in the voice of the suspect in the sample recorded for comparison (or in the disputed utterance). This aspect is rather difficult, as there are no known speaker specific features. The expert has to depend upon his experience to identify the characteristic features which often are:
   - Uncommon
   - Frequently occurring in the disputed utterance(s)
   - Consistent
   - Free from emotional upset or attempted disguise or imitation.
2. **Comparison**; comparison of the disputed and the sample utterances are usually subjective. The results are largely dependent upon the ability and experience of the expert. Some experts assign positions and dimensions to the various extracted features and compare the data so obtained. The approach appears to be more scientific. However, results are not much different even in competent hands.

The success or failure of aural evaluation of voice depends upon:

1. The age and sex of the speaker and the listener
2. Volume of the utterances
3. Interval between the two (the disputed and the sample) utterances.

   Experiments were conducted on the effect of time interval lapsed after listening to the voice; it was found that ability for the recognition of a voice deteriorates rapidly with the passage of time.
4. The number of persons speaking at the crime scene also affects. Experiments show a drastic decrease in voice recognition ability when the number of the person speaking is increased to five or more.
5. Absence or presence of disguise
6. Number of the speech samples
7. Influence of the recording devices
8. Environmental noises
9. The availability/non-availability of the supporting visual evidence
10. Low (< 25 dB) signal (voice) to noise ratio.

Voice recognition experts initiate voice evaluation by listening. It helps to eliminate quite a few innocent suspects without additional wastage of time and money.

Voice expert uses the following parameters to evaluate and compare the disputed and sample utterances:

1. Voice qualities: height, timbre, and fullness
2. The speech peculiarities: speech defects, if any
3. Numerous language parameters including prosody and style
4. Non-vocal speech features such as breathing patterns
5. Idiosyncrasies; abuse of certain words, phrases

6. Visual evidence (in video) of the speaker
7. If the visual evidence of the speaker is available, his mannerism helps.

29.6.2 Computer Analysis

Voice analysis has been facilitated by the advent of computers. They help to analyse, quantify and to describe precisely some of the voice identification parameters, especially:

1. Pitch and pitch contours.
2. Amplitude
3. Duration of the speech segment
4. Vibration period of the vocal cord and other sound-related organs
5. Elimination of noises
6. Efficiency of the devices used for recording, storing, transmission and reproduction of the voice.

29.6.3 Sound Spectrograph

The sound spectrograph is an instrument used to evaluate voice. It converts the speech into visual representation (voiceprints) of its frequency and intensity components. Kersta, an American, introduced the instrument in 1962. It has undergone a sea change since its induction. Kersta claimed that the spectrograms (named as voiceprints by him) obtained through the sound spectrograph were unique and individualistic in nature. He further claimed that they were permanent and remained unchanged throughout the lifetime of a person, even when the person grows old and, or loses teeth, tonsils. He stressed that even disguise or mimicry has no effect on the voiceprints. However, there was no supporting data or even a theoretical basis for these claims. He thought that the voiceprints had the same evidential value as fingerprints. A lot of research work has since been done. It has been found that none of these claims can be sustained except that they are individualistic. In fact, there are so many variables involved that it is difficult to obtain corresponding voiceprints even under ideal conditions. So far, voiceprint evidence has not proved conclusive. There are many pitfalls, which can mislead. All those who are involved in the utilisation of the evidence should be aware of the current status of the reliability of the evidence so that there is no miscarriage of justice.

Some persons have compared the voiceprint evidence to that of handwriting identification evidence. The number of variables involved therein is equally large. Further, handwriting is also amenable to disguise and forgery. Still more, it suffers deterioration due to disease, old age, injury and influence of intoxication. However, there have been a lot of inputs in the case of handwriting evaluation, and it has achieved a high degree of reliability. Similar extensive inputs are needed before the voiceprint identification can achieve a reasonably high degree of reliability. This has to be achieved because, in spite of its lacunae or pitfalls, the evidence of this type is becoming increasingly important. If voice identification does not provide positive proof by itself, it can certainly provide corroboration, indicate leads and help investigations in other ways. It is doing so in many ways.

A sound spectrograph has four parts:

1. Magnetic Recorder
2. Electronic Filters
3. A rotating drum carrying paper around, on which the spectrogram is recorded.
4. An electrically operated stylus to record the graph

The sound spectrograph analyses require only a limited amount of utterance at a time, which could be recorded in one revolution of the drum. It converts the speech signal into a visual spectrum in the form of traces of the graph. The dimensions and the intensity of the traces are dependent upon the utterance being analysed. The use of computers in conjunction with the spectrograph has increased the volume of the recordings. A personal computer based instrument, named Computerised Speech Lab (CSL) has also come up. It records, edits and quickly analyses the speech signals. It is possible to carry out the detailed studies of the utterances through segmentation of the recordings, taking one segment at a time.

When the voice of a person is subjected to spectrographic analysis, the sound energy is converted into electrical energy, which operates the stylus and the stylus, in turn, creates a trace in the form of a graph on the paper on the drum. The graph is known as a spectrogram or a voiceprint.

The spectrogram has the following elements:

1. Horizontal Dimensions
2. Vertical Dimensions
3. Shade Intensity of the trace

Horizontal dimensions represent the time interval of the speech signal. The vertical dimensions indicate the frequency and the darkness indicates the intensity of the loudness of the voice. The visual display of the disputed and the sample utterances (of the same word/text) are compared visually. The patterns have to be different for different persons, but unfortunately, they are also different somewhat for the same person. Besides, the external noises make the problems worse. Further, family members have some commonality in voice. It is due to these factors that chances of misinterpretation exist. Besides, the resolution of the spectrogram was limited previously. It has been improved in recent times and will doubtless improve the evaluations. The inadequate resolution, overlapping of voice spectrograms of the same word, even from different persons, especially from kith and kin creates confusion some times.

The process of using the method is simple. The suspect(s) is made to utter a relevant word(s) and the voice is recorded on a device similar to the one used in recording the disputed utterance. The recorded voices are then turned into voiceprints (spectrograms), their visual equivalents through the Sound Spectrograph. The spectrograms are evaluated and compared *inter se*.

29.6.4 Automated Speaker Recognition (ASR)

The Automatic Speaker Recognition (ASR) system involves the following:

1. Feature Extraction
2. Feature Comparison
3. Normalisation

29.6.4.1 Feature Extraction

Feature extraction is the most difficult task. The feature has to be unique, consistent and free from internal and external influences. It should be easily measurable, not changed with time or health of the speaker and not affected by external noise or transposing equipment. The source of the feature, the word, should be occurring frequently in the speech to make it easily available for analysis. It should withstand disguise or mimicry and it should survive the use of various machines, which are used in voice analysis. A lot of work has been done in this direction. A number of systems have been developed but none has so far given 100% reliable results. The research goes on.

29.6.4.2 Feature Comparison

As no speaker-specific features have been discovered so far, all available features are considered for comparison. The following features have been compared through computers.

1. Linear Prediction Coefficients
2. Central Coefficients

These features are evaluated and compared *vis-à-vis* similarities found on the disputed and the test speech templates by a number of systems. The Gaussian Mixture Model is found better than others. If the similarities reach the threshold[3] or go beyond, the voice is identified. If the threshold in not reached, the voice is not identified.

29.6.4.3 Normalisation

The normalisation process involves elimination or reduction of the inherent variations present in *intra* speaker utterances of the same text, the influence of environment and of the devices used in the process of identification. The following processes are used for the purpose:

1. Spectral Equalisation
2. Spectral Subtraction
3. Missing Feature Compensation

The details of these processes are beyond the scope of the present work. It may, however, be mentioned that complete success to normalise the utterances for forensic evaluations is yet to be achieved.

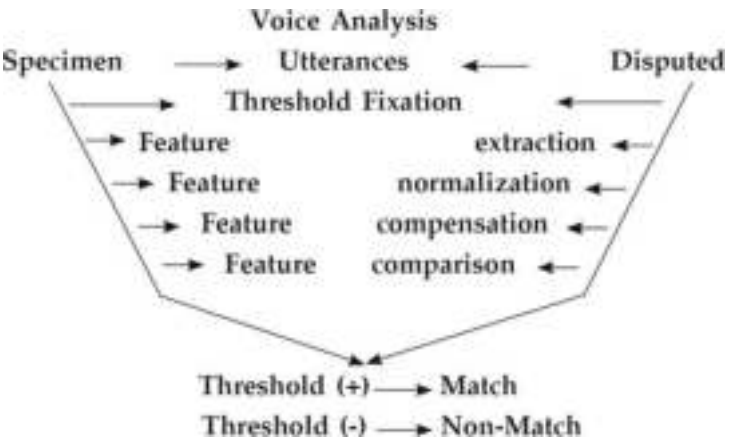

Fig. 29.3

Speaker Recognition

29.7 INTERPRETATION

All forensic identifications aim at achieving the practical individuality of the source. It is possible in some types of evidence, not in others. In voice evaluations, instrumental individualisation of voice source is difficult to achieve with certainty. It has been possible in some cases to give a high probability of the identity of the speaker. In some other cases, however, fairly high probability on the non-identity of the speaker has been achieved.

3. Threshold is the prefixed identification data for recognition of the voice.

The usual results given by the experts fall in the following categories:

1. Identification of the voice:
   - High probability
   - Probable
   - Possible
   - Evidence insufficient for opinion
2. Elimination of the speaker:
   - Positive in some cases
   - Highly probable exclusion in some other cases
   - Probable exclusion
   - Possible exclusion
   - Insufficient evidence for exclusion

29.8 MISCELLANEOUS

The evaluation of utterances is useful for many forensic needs, notably for:

1. Psycholinguistic Profiling
2. Determining the integrity of the recorded utterances
3. Transcription of the taped utterances

29.8.1 Psycho-linguistic Profiling

The personality profile of a person is built up from his utterances. The following factors help:

1. The dialect of the utterance
2. The accent of the speaker
3. The pitch and loudness of the voice
4. The words, phrases and the sentences he uses in his utterances
5. The pronunciation of the speaker
6. The defects in the voice, speech of the speaker
7. The inter-mixing of the languages, dialects, in the utterance
8. The abuse of certain words and phrases
9. The obscenities uttered by the speaker. Foul language is common among criminals
10. The pet words, slangs and phrases
11. The points or words on which the emphasis laid, in the utterances

Profiling of the criminals from language has come up as an important branch of Forensic Psychology. It is assuming greater and greater importance with the passage of time. In the absence of eyewitnesses, psycholinguistic profiling will be of great help to locate and identify a criminal.

29.8.2 Integrity of Recorded Voice

Integrity of the voice on various recording devices sometimes assumes importance, especially in the following situations:

1. Involvement of the speaker in crimes like murders, dacoities, corruption cases, organised crimes, extortion

2. Fixing adultery in divorce cases
3. Identification of members of the gang or criminal organisations
4. Identification of the fanatic speaker who inflames communal hatred or anti-national feelings/activities

29.8.3 Tampered Integrity of the Recorded Voice

There are a number of ways in which the recorded utterances are tampered. The main modes are:

1. **Deletion**; it is the easiest form of damaging the integrity of the recorded voice.
2. **Addition**; it is also easily done
3. **A synthesis of utterances**; from some innocent recorded speech/ utterance/ conversation

The alteration of a recorded voice can be accomplished on all sorts of recording devices. It is comparatively easier to make changes in digitally recorded speech than that on a magnetic tape analog.

It is often difficult to know the deleted text though it may be possible to detect alteration. The success or failure of the detection depends upon the extent of the alterations made. Lesser the volume of the altered text, fewer is the chances of detection and *vice versa.* It also depends upon the device used for making the changes. If the alteration is with the same device as used for the original input, the task of detection is more difficult. Above all, it depends upon the technical know-how of the perpetrator, the more conversant he is with the process, he does a better job of alteration, increasing thereby the difficulties of the detection and hence of the investigations.

29.8.4 Transcription

Transcription is the conversion of the recorded utterances into a written record. The process offers no problems when the person carrying out the transcription knows the language and the text is normal: not encrypted or distorted, intentionally or otherwise. In the latter cases, the evaluation of the voice may need expertise in phonetics, linguistics. Besides, in cases of gross distortions of the recorded voice one may have to use frequency filters and other devices to figure out the text. The general process of evaluation is to:

1. Listen to the entire text repeatedly.
2. Separate intelligible and unintelligible texts.
3. Separate the utterances of each person if there is more than one speaker.
4. Use sound filters to reduce/ eliminate noise and thus enhance the intelligibility.
5. Break the difficult passages into segments and subject them to phonetic, linguistic and/or spectrographic analysis, with the help of the specialist(s).
6. Demarcation of the boundaries in the spectrograms often helps.

It is not always possible to figure out the entire text of the utterance. The person carrying out the transcription should indicate:

1. The clearly identified text
2. The ambiguous text with their ambiguities
3. The possible text
4. The uncertain text

Voice analysis has been, and is, a potent weapon in the fight against crime. It has to be improved through research. This weapon will be needed more frequently in the coming times when the other types of evidence will be becoming scarcer.

Forensic phoneticians

Forensic phoneticians are like medical doctors giving prognoses. They make many tests that provide useful clues, but their opinions are inevitably based on their own experience....they have evidential value, but they are not established scientific truths[1]

Voice Disguise

If you fancy scaring the hell out of someone, while remaining totally disguised, then this is the gadget for you.

It has six voice changing options, and digitally changes your voice frequency to enable your voice remains incognito. The fun possibilities are endless. The facility is available in some cell phones.

Fig. 29.4
Digital Voice Changer

29.9 ADDITIONAL READING

1. *Beigi, Homayoon, Fundamentals of Speaker Recognition*, New York: Springer, ISBN 978-0-387-77591-3, 2017.
2. Sadaoki Furui, *Speaker Recognition*, Scholarpedia, 3(4): 3715, 2007.
3. Rose,, *Forensic Speaker Identification,* New York, USA, p 2002.

29.10 CASE LAW

29.10.1 Tape Recorded Evidence[4]

This court in *N. Sri Rama Reddy v V.V. Giri*[5], accepted conversation or dialogue recorded on a tape recording machine as admissible evidence. In *Nagree's* case the conversation was between Nagree and Sheikh. Nagree was accused of offering a bribe to Sheikh.

4. *R Venkatesan v State*, 1980 Cr LJ 49.
Also see: *Central Bureau of Investigation v Abdul Karim Ladsab Telgi*, 2005 Cr LJ 2868 : 2005 (4) Rec Cri rule 258; *State of Bombay v Kathi Kalu Oghad*, AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC); *RM Malkani v State of Maharashtra*, AIR 1973 SC 157 : 1973 SCC (Cri) 399 : 1973 Cr LJ 228; *Pratap Singh v State of Punjab*, AIR 1964 SC 72 : (1966) 1 Lab LJ 458 : (1964) 4 SCR 733. In the case of *Ram Singh v Col. Ram Singh*, AIR 1986 SC 3 : 1985 (Supp) SCC 611; *Ziyauddin Burhanuddin Bukhari v Brijmohan Ramdass Mehra*, AIR 1975 SC 1788 : (1976) 2 SCC 17 : 1975 Supp SCR 281, the Apex Court considered the value and use of transcrpts; *N Sri Rama Reddy v VV Giri*, AIR 1971 SC 1162 : (1971) 1 SCR 399 : 1971 (1) SCJ 483; *RM Malkani v State of Maharashtra,* AIR 1973 SC 157 : (1973) 1 SCC 471 : 1973 Cr LJ 228.
5. AIR 1971 SC 1162 : (1971) 1 SCR 399 : 1971 (1) SCJ 483.

In the *Presidential Election* case[6], questions were put to a witness Jagat Narain that he had tried to dissuade the petitioner from filing an election petition. The witness denied those suggestions. The election petitioner had recorded on tape the conversation that had taken place between the witness and the petitioner. Objection was taken to admissibility of tape recorded conversation. The court admitted the tape recorded conversation. In the *Presidential Election*[7] case, (supra) the denial of the witness was being controverted, challenged and confronted with his earlier statement. Under section 146 of the Evidence Act questions might be put to the witness to test the veracity of the witness. Again under section 153 of the Evidence Act a witness might be contradicted when he denied any question tending to impeach his impartiality. This is because the previous statement is furnished by the tape recorded conversation. The tape itself becomes the primary and direct evidence of what has been said and recorded.

Tape recorded conversation is admissible provided first the conversation is relevant to the matters in issue; secondly, there is identification of the voice; and, thirdly, the accuracy of the tape recorded conversation is proved by eliminating the possibility of erasing the tape-record. A contemporaneous tape-record of a relevant conversation is a relevant fact and is admissible under section 8 of the Evidence Act. It is *res gestae.* It is also comparable to a photograph of relevant incident. The tape recorded conversation is therefore a relevant fact and is admissible under section 7 of the Evidence Act. The conversation between Dr. Motwani and the appellant in the present case is relevant to the matter in issue. There is no dispute about the identification of the voices. There is no controversy about any portion of the conversation being erased or mutilated. The appellant was given full opportunity to test the genuineness of the tape recorded conversation. The tape recorded conversation is admissible in evidence.

It was said by counsel for the appellant that the tape recorded conversation was obtained by illegal means. The illegality was said to be in contravention of section 25 of the Indian Telegraph Act. There is warrant for proposition that even if evidence is illegally obtained it is admissible. Over a century ago it was said in an English case where a constable searched the appellant illegally and found a quantity of offending article in his pocket that it would be a dangerous obstacle to the administration of justice if it were held, because evidence was obtained by illegal means, it could not be used against a party charged with an offence. See *Jones v Owen.*[8] The Judicial Committee in *Kuruma, Son of Kanju v R.*[9] dealt with the conviction of an accused of being in unlawful possession of ammunition which had been discovered in consequence of a search of his person by a police officer below the rank of those who were permitted to make such searches. The Judicial Committee held that the evidence was rightly admitted. The reason given was that if evidence was admissible it matters not how it was obtained. There is of course always a word of caution. It is that the judge has a discretion to disallow evidence in a criminal case if the strict rules of admissibility would operate unfairly against the accused. That caution is the golden rule in criminal jurisprudence.[10]

2. It is too late in the day to challenge the admissibility of a conversation which has been tape-recorded earlier if the same is relevant. As early as 1956, Bhandari, C.J. in *Rup Chand v Mahabir Parshad*[11] had categorically laid down that such a tape-recording was clearly admissible. The learned Chief Justice had relied on a number of American and English cases in support of his decision. In *S. Partap Singh v State of Punjab,*[12] the learned judges of the Supreme Court relied heavily on the tape-recording which had been put on the record by the petitioner. In fact the admissibility of the same was considered self-evidence. Their lordships expressly

6. AIR 1971 SC 1162 : (1971) 1 SCR 399 : 1971 (1) SCJ 483.
7. *Ibid.*
8. (1870) 34 JP 759.
9. 1955 AC 197 : (1955) 2 WLR 223 : (1955) 1 All ERR 236 (PC).
10. *RM Malkani v State of Maharashtra*, AIR 1973 SC 157 : (1973) 1 SCC 471 : 1973 Cr LJ 228.
11. AIR 1956 P&H 173 : 58 Punj LR 441 : ILR 1956 Punj 1351.
12. AIR 1964 SC 72 : (1966) 1 Lab LJ 458 : (1964) 4 SCR 733.

adverted to the admissibility and the evidentiary value of the tape-recorded talk which had been produced as part of the supporting evidence produced by Dr. Partap Singh, the petitioner in that case. A clear and unequivocal enunciation of the law is made, however, by the court of Criminal Appeal in *Rex v Maqsud Ali and Ashiq Hussain,*[13] in the following terms:

> *We think that the time has come when this court should state its views of the law on a matter which is likely to be increasingly raised as time passes. For many years now photographs have been admissible in evidence on proof that they are relevant to the issues involved in the case and that the prints as seen represent situations that have been reproduced by means of mechanical and chemical devices. Evidence of things seen through telescopes or binoculars which otherwise could not be picked up by the naked eye have been admitted and now there are devices for picking up, transmitting, and recording conversations. We can see no difference in principle between a tape recording and a photograph. In saying this we must not be taken as saying that such recordings are admissible whatever the circumstances, but it does appear to this court wrong to deny to the law of evidence advantages to be gained by new techniques and new devices, provided the accuracy of the recording can be proved and the voices recorded properly identified; provided also that the evidence is relevant and otherwise admissible, we are satisfied that a tape-recording is admissible in evidence. Such evidence should be regarded with some caution and assessed in the light of all the circumstances of each case. There can be no question of laying down any exhaustive set of rules by which the admissibility of such evidence should be judged.*

Lastly in *Yusufalli Esmail Nagree v State of Maharashtra,*[14] the learned judges of the Supreme Court in expressly considering this case have observed as follows:

> *The process of tape-recording offers an accurate method of storing and later reproducing sounds. The imprint on the magnetic tape is the affect effect of their relevant incident, a contemporaneous tape-record of a relevant conversation is a relevant fact and is admissible under section 7 of the Indian Evidence Act.*

Their lordships in this case noticed the reasoning of *Rup Chand's* case[15] with approval. In this context it is futile now to argue that a tape-recording is not admissible in evidence.

Once it is held that a tape-recording is admissible, the manner and mode of its proof and the use thereof in a trial is a matter of detail. That it can be used for the purpose of confronting a witness with his earlier tape-recorded statements admits hardly of any doubt. That it may also be legitimately used for the purpose of shaking the credit of a witness was laid down in clear terms by Bhandari, C.J., in *Rup Chand's* case[16] in the following terms:—

> *I am aware of no rule of evidence which prevents a defendant who is endeavouring to shake the credit of a witness by proof of former inconsistent statements from deposing that while he was engaged in conversation with the witness a tape-recorder was in operation, or from producing the said tape-recorder in support of the assertion that a certain statement was made in his presence.*

That being so, for a use of an earlier tape-recorded statement, the identification of the taped voices is hence a crucial matter and indeed such proper identification is the *sine qua non* for the use of the earlier tape-recording. The relevant authorities are all unanimous on the necessity of such proper identification of the taped voices. In *Yusufalli Esmail Nagree v State of Maharashtra,*[17] it was observed as follows:

> *If a statement is relevant an accurate tape-record of the statement is also relevant and admissible. The time and place and accuracy of the recording must be proved by a competent witness and the voices must be properly identified.*

The cases where the taped voice is admitted thus present no difficulty. However, where the voice is denied by the alleged maker thereof, a comparison of the same becomes inevitable. As observed by the Supreme Court the proper identification must be proved by a competent witness. Learned counsel has been unable to point out anything in the relevant statute which

13. (1965) 2 All ER 461 (464).
14. AIR 1968 SC 147 : 70 Bom LR 76 : 1968 Mad LJ (Cri) 247.
15. AIR 1956 P&H 173 : 58 Punj LR 441 : ILR 1956 Punj 1351.
16. *Ibid.*
17. AIR 1968 SC 147 : 70 Bom LR 76 : 1968 Mad LJ (Cri) 247.

expressly or impliedly may tend to prohibit such a comparison. At the present stage the nature of the evidence that would be brought forward for this purpose, and whether the court can itself compare the admitted and the disputed tape-recording is not yet in issue. I am, therefore, inclined to the view that the orders of the courts below are thus clearly sustainable.[18]

We are left with the tape-recorded conversation which according to the prosecution, corroborates the evidence of P.W. 1. A tape recorder was given to P.W. 1 to record the conversation. The learned Magistrate while dealing with the recorded conversation on the tape states:

> I closely observed the playing of the cassette in court and found that it contained substantially the version given by P.W. 1 in court regarding the conversation had by him at the time of alleged payment of amount to him.

I may at once point out that I have also had the tape M.O. 3 played in open court and to me most of the conversation was not clear. Even P.W. 1 is of the same view. He states that certain portions in the tape are clear and other portions are not clear. He also states that he does not know the reason for that. P.W. 3 states that the tape recorder was played in the office in the presence of the appellant and others and it contained the conversation between P.W. 1 and the appellant. He would also say that M.O. 3 was played again in the office at 3.40 p.m. and a transcript of the dialogue between P.W. 1 and the appellant was taken in his presence and that is Ex. p 13 in which P.W. 8 and the three inspectors have attested. In cross examination he admitted that when for the first time tape recorder was played, the entire conversation was not transcribed and therefore it was played again and certain portions in the conversation are not clear. P.W. 8, the investigating officer, admitted that he heard the tape recorded conversation and in some places the conversation is not quite clear. P.W. 8 is not able to say as to who spoke the words 'Please don't take it as a bribe'. In *Yusufalli Esmail Nagree v State of Maharashtra,* AIR 1968 SC 147 : 70 Bom LR 76 : 1968 Mad LJ (Cri) 247, the Supreme Court observed:

> *If a statement is relevant, an accurate tape record of the statement is also relevant and admissible. The time and place and accuracy of the recording must be proved by a competent witness and the voice must be properly identified. One of the features of the magnetic tape recording is the ability to erase and re-use the recording medium. Because of this facility of erasure and re-use, the evidence must be received with caution. The court must be satisfied beyond reasonable doubt that the record has not been tampered with.*

Bearing these observations in mind, we may analyse the evidence in regard to the tape recorded conversation. I earlier pointed out that P.W. 1, P.W. 3 and P.W. 8 say that certain portions of the conversations between P.W. 1 and the appellant recorded by the tape-recorder are not clear. The evidence of P.W. 3 also shows that the tape-recorder was played twice. The most important condition of identifying the voice has not been satisfied in this case. P.W. 8, the investigation officer, admits that he did not examine P.W. 1 with reference to the conversation in the tape. P.W. 1 states in his evidence that he heard the tape-recorded conversation for the first time in court (before the trial magistrate). The evidence of P.W. 1 and P.W. 8 very clearly shows that the voices of P.W. 1 and the appellant have not been identified. Without identifying the voice Ex. p 13, which is a transcript of the alleged dialogue between P.W. 1 and the appellant was prepared by P.W. 8, the investigating officer. It is not clear as to how in the transcript Ex. 13, P.W. 8 is able to point out the words spoken by P.W. 1 and the appellant. Even in the transcript, we find a reference to the fact that the conversation is broken at a very crucial place. The appellant in his statement states that the conversation has been tampered with. P.W. 1 should have identified his voice and the voice of the appellant in the recorded conversation. But P.W. 8 admits that the tape was never played before P.W. 1. P.W. 1 himself says that he heard tape-recorded conversation for the first time in court. The accuracy of recording has not been proved by a competent witness and the voices have not been properly identified. Under those circumstances it is not safe to rely on this tape-recorded evidence of P.W.

18. *Dial Singh Narain Singh v Rajpal Jagan Nath*, AIR 1969 P&H 350 : 71 Punj LR 519 : 1969 Cr LJ 1422.

CHAPTER 30

FORENSIC PSYCHOLOGY

SYNOPSIS

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30.1 GENERAL

Forensic psychology is the body of the scientific knowledge of psychology, applied and utilised in legal matters, usually in the court of law. It may be used at the pre-trial stage, during the trial or at post-trial stage. The American Board of Forensic Psychology has defined forensic psychology in the following words:

> *Forensic Psychology shall mean the application of the science and profession of psychology in relation to questions and issues to law and legal systems.*

A more comprehensive definition includes its diverse involvements and applications. Thus:

> *Forensic Psychology is the development and application of the principles of psychology to solving and the handling of legal, judicial, correctional and law enforcement problems which have their roots in psychology and its branches. It is multidisciplinary in nature and involves both social sciences (law, Sociology, Political Science) and natural sciences (Anthropology, Medicine.).*[1]

Forensic Psychologist is one who has studied psychology, who is trained in Forensic psychology and who practises it in court as an expert to assist the courts to assess the personalities of the persons involved and to evaluate the occurrences accordingly.

1. Adapted from the definition given in JJ College Website.

Forensic psychologists work for both prosecution and defence and of course, assist the courts in evaluating persons, events and situations.

The terms "Forensic Psychology" and "Forensic Psychiatry" are often used interchangeably. They are two distinct disciplines. Forensic psychiatry deals with medical problems relating to mental abnormality. The psychiatrist is sometimes called to give evidence whether the accused person, who has taken insanity as a defence, is really insane or he is shamming insanity. In some cases, a man with mental abnormality may have committed a crime. The psychiatrist assesses if criminal responsibility can be attributed to that person. The psychiatrist in such cases has to appear in courts. Hence, the terms: Forensic Psychiatry and Forensic Psychiatrist.

Forensic psychology/psychologist is not involved in the medical mental aberrations problems. They are concerned with the behaviour, thought processes and the intentions of the persons involved and also their effects on the body — the psychosomatic manifestations. In some cases, a forensic psychologist is also called to assess mental abnormality but in such cases, a psychiatrist should also be consulted. Ordinarily, the Forensic Psychiatrist has his basic education in medicine, and the Forensic Psychologist has his basic education in psychology.

30.2 NATURE

Forensic psychology, as already seen, is the application of psychology in the dissemination of justice. Psychology in itself means the study of human behaviour, a person's thought processes, his intentions, his attitudes toward humans, towards life, his concepts of right and wrong and his thinking about his duties towards the society and *vice versa*. The major problem in Forensic psychology is to understand the above traits of human behaviour and to link or de-link them with the criminal act. The second important task of Forensic psychology is to rehabilitate the convicted offender. In addition, forensic psychology also tackles many other forensic problems. They are enumerated below.

30.2.1 Emotions

The investigators, the counsels and the judges have been utilising forensic psychology even in olden days but without a name. Ordinarily, stress and conflict created emotional upset under certain situations. For example, when a person is being interrogated about an unpleasant matter, his emotions about the matter would be reflected in the form of body signs: Psychosomatic manifestations! Varied emotions create these body signs. In general, they are due to:

1. Fear
2. Anger
3. Greed
4. Ego
5. Love/hate
6. Fanaticism/religious fervour
7. Sense of duty — towards family, community, society, nation, humanity
8. Happiness
9. Courage
10. Human values
11. Disgust, sadness
12. Compassion

30.2.2 Body Signs

The subject manifests body signs, under both u-stress and distress. They include:

1. **Facial Changes:** if the subject is frightened, his face would turn ashen. If he becomes angry, his face would redden. "Lost colour" and "red faced" are the phrases often used in such cases, respectively.
2. **Contortion:** the subject, under great mental stress and conflict, suffers facial contortions. Lips, nose, cheeks, forehead often distort. Eyes may start watering (weeping), or they may become "bloodshot".
3. **Perspiration:** the subject perspires when frightened.
4. **Stuttering:** the subject stutters if he is asked incriminating/embarrassing questions.
5. **Eye contact**: the subject avoids eye contact. He shifts eyes under stress/fright.
6. **Fidgeting:** the subject shifts his body position frequently when he finds the interrogation uncomfortable. He may also scratch some body parts.
7. **Dry Mouth:** the subject takes frequent sips of water, as fear turns his mouth dry.
8. **Delayed answers:** the subject takes a longer time to answer questions or stops answering questions altogether when he wants to avoid answering or to tell lies.
9. **Emotional breakdown:** the subject may break down and start weeping.
10. **Hysterical fit:** the subject goes hysterical and starts abusing, quarrelling or laughing. He may even try to harm himself or the interrogator.

30.2.3 Subtle Psychosomatic Changes

In addition to the visible body signs, the subject under stress also suffers invisible subtle psychosomatic changes. Instruments have come up to detect these changes. They are being used in interrogations to find the truth. The changes utilised are in:

- Blood pressure
- Respiration rate
- Pulse rate
- Electrical resistance of the skin
- Subsonic vibrations of the vocal cord
- Brain activity: Brain Electrical Activation Profile (BEAP)

Numerous tools and techniques are utilised to study these changes extensively in interrogation. The important ones, which are becoming more and more popular, useful and assuming tremendous importance, are:

1. **Psychological Detection of Deception (PDD):** Polygraph — A Lie Detector is the instrument being used for the purpose.
2. **Narco-analysis:** it is an interrogation technique. It was not exploited extensively in the past. It is being used increasingly now. It involves the brain part, which invents false answers through its reasoning. Narco-analysis suppresses its reasoning and rationalisation power and the subject give truthful answers.
3. **Brain printing or profiling:** it is believed that brain profiling has a great future to extract the truth. The brain is the storehouse of all information that a person possesses. If this source can be tapped to get the truth, it can be an immeasurable

help to the criminal justice system. Tremendous research work is going on just trying to find ways and means to get at the truth via brain printing.

4. **Hypnosis: it** means putting the subject in a trance and interrogated. In this state of trance, the subject is not able to reason. He, therefore, speaks whatever he remembers of the occurrence. Hypnosis has proved useful in many cases especially with frightened subjects.
5. **Psychological Stress Evaluator:** it utilises sub-sonic vocal cord vibrations which show changes when the person is telling lies. The voice and vibrations are recorded, and the sub-sonic vibrations are studied. It can be used both overtly and covertly.

The method has not been used extensively in crime cases.

30.3 APPLICATIONS

Forensic psychology is comparatively a newcomer in the criminal justice system in India. However, due to its wide and impressive applications, its use is increasing rapidly in all types of cases involving criminal, civil, family and juvenile laws. Its use prevails in all aspects of criminal justice system: at the investigative stage, in trials, to ascertain if the subject is fit to undergo a trial or capable of giving evidence, in determining quantum and nature of punishment or at the correctional stage to guide the juveniles. In addition, it tackles social deviance among the prisoners.

Forensic psychology, in brief, helps to ascertain:

1. **Sanity:** is the accused person sane, capable of understanding the nature of the crime and that of trial. Or, is he insane and does not understand the nature and the meaning of crime and the proceedings, and thus incapable to plead his case, or to waive his right to defend himself.
2. **Malingering:** is the person feigning incapacitation to claim damages in some case of an accident in which he was involved? Or, is he exaggerating the incapacitation?
3. **Treatment of juvenile offenders:** forensic psychologists are being used increasingly to treat juvenile offenders to bring them to normal behaviour, often on the recommendation of the juvenile courts.
4. **Accused adult or juvenile:** a forensic psychologist can evaluate and help the court to decide whether the person undergoing trial should be treated as an adult or as a juvenile, as per his mental and emotional development, at the time of committing the crime, or at the time of trial.
5. **Nature and quantum of punishment:** a forensic psychologist can help the court to decide about the quantum of punishment to meet the ends of justice on the one hand and the welfare of the society on the other. What should be the best punishment in a given case? The court often has to decide whether the person under trial should be sent on probation; or, should he be sent to prison. Psychological evaluation helps to decide.
6. **Delinquent's personality assessment:** juvenile courts often need a brief on the personality of the delinquent so that they can choose the correct sentence — alternative to imprisonment: probation, or psychotherapy, to make him a useful citizen without endangering the society. The forensic psychologist, after evaluation provides the brief.
7. **Competency of the subject:** courts and public are increasingly demanding determination of competency of a person for:
   - Guardianship of a ward

- Awarding citizenship to an immigrant applicant
- Making a Will, Contract, and Conveyance Deed
- Suitability of a person as a marriage partner
- Suitability for employment, especially in sensitive secret government organisations
- Admission to prestigious institutions
- Degree of impairment or disability for compensation assessment
- Placement or promotions

8. **Criminal's profile:** profiling of the criminal, for court purposes, is extensively being utilised from the following:
   - Psycho-linguistic analysis
   - Behaviour at the crime scene
   - Treatment of the victim(s)
   - Vandalism at the scene
9. **Prediction of violence and assessment of risk:** the post-conviction treatment of the criminal depends upon whether the criminal is prone to violence and if so how much is the risk. Forensic psychologist is the person to determine it.
10. **Criminal responsibility:** the criminal responsibility of a person involved in a crime varies. .Was he provoked? Was he taking revenged? Or, did he commit the crime for sadistic pleasure? Forensic psychologist is a person to determine it.
11. **Mitigating factors:** the psychologist ascertains if there were some mitigating circumstances which should invite lesser punishment to the accused.
12. **Drug addiction:** the science is being used to ascertain whether the given person is a drug addict or has a tendency to become one.
13. **De-addiction:** forensic psychologist is helping addicts and drunkards to bring them to normalcy.
14. **Truth through interrogation:** most importantly, Forensic psychology is being utilised in the interrogations of the culprits (suspects), victims and witnesses for finding out the truth about the occurrence and background information about the crime.
15. **Stress management:** Forensic psychologists are helping criminal and shocked victims of crime to normalisation by stress management.

Forensic psychologists are increasingly participating in the teaching and training program of the investigating officers, prosecutors and judges so the justice delivery system is improved.

16. Dissemination of essentials of Forensic Psychology to non-expert professionals (judges Lawyers, Reformatory home and prison staff).

30.4 CLASSIFICATION

Forensic psychology is usually divided into the following classes for the convenience of study and application:

1. Clinical Psychology
2. Experimental Psychology
3. Statistical Psychology

4. Psycho-therapy
5. Consultancy Psychology

30.4.1 Clinical Forensic Psychology

The clinical approach evaluates the subject in its entirety: environmental influence, educational contributions, marital influence and family background. Complete understanding of the subject facilitates better handling of the problems of the subject.

Clinical forensic psychology requires a close personal relationship of the forensic psychologist with the subject for better evaluation of the subject in all aspects. In short, it is a subject-centered process. The clinical approach often develops into a personal relationship, which may raise some ethical problems sometimes.

> *In a case of killing of an intruder, the husband claimed that he killed the intruder because the fellow had assaulted his wife. The wife claimed that her husband was not at home and the intruder had entered the house and did not leave the house in spite of her warning him a number of times. As he threatened to overpower her, she, in self-defence shot at him and killed him. The court called in a forensic psychologist to resolve the issue. It appeared that the husband was not present at the scene at the time of occurrence. The case was adjudged as a case of killing in self-defence. It ended in acquittal. (CH)*

The maximum use of clinical psychology is in road accident cases where damages are claimed for possibly non-existing injuries or trauma. Clinical psychology has also assisted to unravel the allegedly false rape cases.

> *A young lady approached the police that someone was pestering her through obscene calls. The police checked all the incoming calls for a number of days but there were no such calls. When she persisted in her complaints, a psychologist was asked to check her. He that there were no such calls. She was told accordingly and asked to stop pestering the police. (CH)*

Rash drivers, being prosecuted, sometimes seek the help of a forensic psychologist to establish mitigating circumstances for the cause of the accident.

Clinical forensic psychology has also proved useful in cases of nervous victims or witnesses. Hypnosis has been successfully employed in some cases.

> *A sex criminal attacked two girls. The girls offered resistance. In the fight he killed one of the girls and raped the other. The girl was so frightened that when the police would start interviewing her about the assailant she would swoon. Ultimately, she was put under hypnosis for interrogation. The girl not only gave a complete description of the culprit but also informed the police that she had seen him, more than once, before the occurrence also. The police was sure that the culprit was a local person. They also reconstructed the photograph (photo-fit method). When the girl was shown the photograph she swooned again, confirming thereby his identity. (CH)*

30.4.2 Experimental Forensic Psychology

Experimental forensic psychology has become a convenient handmaiden of the criminal justice system. It can analyse, explain and predict facts in such definite terms in some cases that it is simply amazing. It is helpful to solve many legal problems of diverse nature whether they are criminal or civil in nature. The following situations illustrate the use of experimental psychology to serve the cause of justice:

> *In a case of an accident due to rash driving, it was essential to check the truthfulness of a person who gave the evidence that he could read the registration number of the offending vehicle. The witness was asked to note the number of a running vehicle at a particular speed from the distance given by the witness, under the lighting conditions of the incident at the spot where the accident had occurred. He could not read the number. (CH)*

Whether a plea for diminished responsibility can be accepted for a given reason beyond the control of the accused person can also be ascertained by experimental psychology.

In a case, the accused alleged that the accident has been caused because he had taken some medicine. The accused was given the same dose of medicine, which had caused the accident without his knowledge. The person was observed to see if the drug has adversely affected his faculties and thus could have caused the incident. The medicine did not affect the accused. (CH)

Experimental data may be needed in certain claim cases to ascertain the validity or otherwise of the claim.

In a case of death of a worker due to an accident in the factory, the management claimed that the accident was due to negligence of the worker. The relatives of the worker, on the other hand, claimed a lack of adequate safety measures. Previous records were checked. New experimental data was generated. It was found that the machines did need additional safety measures. The management had to pay appropriate compensation. (CH)

Ordinarily, the experimental work is conducted at the site of the incident, simulating the conditions of the incident. However, sometimes the experiments have to conduct in the laboratory or where the subject is housed, including the jail rooms or at the premises of the jail. As long as the subject and the authorities are willing to cooperate, the site of the experiments poses no serious problems in most of the cases.

Experimental forensic psychology has been extensively utilised to establish *corpus delicti* and the identity of the culprit.

30.4.3 Statistical Forensic Psychology

Evaluations of statistical data of forensic importance relating to forensic psychological studies of a subject have always been important and have been utilised extensively over the years. The main sources for the data are:

1. The personal history of the subject in its entirety, especially relating to psychological aspects, is important. The data is obtained from the members of the family, friends of the subject, his schoolmates, schoolteachers and colleagues. If he is a member of a club, the staff and the members of the club may also be in a position to provide necessary data.
2. Writings and spoken words often provide useful data about the personality of the writer or speaker. Some research workers have refined the technique to a degree that they are able to indicate the personality of the subject from these studies alone. The branch of the science has been named as Psycholinguistics.
3. Interviews and interrogations are the mainstay of statistical data. It is more reliable also, as the scientist himself is collecting it. Tools and techniques of interrogation are legions.

Experimental data in some cases is indispensable to generate adequate statistical database. It must be understood that statistical data has been misused in the past. It can be misused in the future also. Besides, statistics give probabilities only, which are not understood by some courts.

30.4.4 Forensic Psychotherapy

Forensic psychotherapy has come up in a big way, as help, to the criminal in the criminal justice system. As the very name indicates, it means psychological treatment of the offenders, victims or even of the witnesses to further the cause of justice. It takes many forms:

1. Culprits, victims or witnesses who are dazed, may need psychotherapy to normalise them.
2. Some accused persons are emotionally so upset that they are not in a position to stand trial. Psychotherapy stabilises them and thus enables them to stand trial.
3. Psychotherapy helps victims and witnesses to remember details of the occurrence, which they have forgotten.

4. Psychotherapy allows assessment of whether a person is telling truth or lies. The treatment can convert a liar into a truthful person.
5. Psychotherapy has been extensively utilised in treatment of offenders, especially of juvenile delinquents, first offenders and all those who have been assessed to be amenable to psychotherapy.
6. Psychotherapy is being introduced in jails to make the inmates useful citizen after their release from the jails.
7. Psychotherapy is being used increasingly for de-addiction and curing drunkenness.

30.4.5 Forensic Psychological Consultancy

Forensic psychologist, as a consultant, is playing an increasingly important role in the dissemination of justice. He is being consulted by:

1. **Courts;** about the dangerous potential of a criminal to the society, about the personalised punishment to the offender, in order to inflict minimum damage to his personality, consistent with the fact that justice is also being done to the victim/society. He is consulted to stabilise accused, victims and witnesses in trials.
2. **Advocates;** for their clients to find out if:
   - The client is fit to stand trial or not.
   - The plea of temporary insanity at the time of commission of crime can be taken or not.
   - The mental age of the offender can be proved to be such that punishment, alternative to imprisonment, could be pleaded.
   - If the provocation of the victim, beyond tolerance limit, could be shown as defence plea.
3. **Family matters:** the need for consultancy in family problems is becoming more pressing, especially relating to the custody of the child. Whether the custody of the father or the mother or of a third party would be in the interest of the child, often calls for the opinion of a forensic psychologist. This is especially so when the parents (one or both) have unsociable or criminal tendencies and background.

   Forensic psychologists are being consulted increasingly in marriage or divorce problems by the society and the courts.
4. **Rehabilitation of prisoners:** The services of forensic psychologists are being utilised increasingly in handling and rehabilitation of the prisoners. Their services are becoming indispensable in cases of juvenile delinquents, to determine the patterns of treatment to normalise their psychological and social personalities. The psychological treatment of the impulsive criminal is being envisaged increasingly.

30.5 PROBLEMS/POSSIBILITIES

Forensic psychology is expanding its ramifications in all aspects of the criminal justice system, with the passage of time. It currently provides answers to the following types of questions:

1. Can the subject, accused of a crime, be assigned criminal responsibility?
2. Is the subject competent to stand trial, wave his constitutional rights or execute a contract or a will, in view of the alleged malfunctioning of his brain?
3. Can the psychologically incompetent subject be made competent by psychotherapy to perform his legal obligations?

4. Does the subject suffer from a brain injury, if so, to what extent?
5. Was the subject, at the time of the commission of crime temporarily insane or dazed, due to emotional breakdown, the influence of drugs or liquors or due to physical injury, to claim diminished responsibility?
6. Is the subject suffering from amnesia? If so, what are its nature and the extent? Or, is he shamming amnesia to avoid criminal responsibility?
7. Does the subject have criminal tendencies? Has he committed a crime(s) previously?
8. Has the employee committed a crime? Is he likely to commit crime again?
9. Can the criminal be treated to stop recidivism?
10. Is it possible to remove the stigma of imprisonment from the mind of the subject?
11. What should be appropriate punishment to the subject, especially if he happens to be new to the crime or is a young person? Imprisonment? Fine? Suspended sentence? Probation? Restitution? Or, can psychotherapy help and replace conviction?
12. Is psychotherapy useful to all prisoners? Or, which prisoners will be amenable for treatment?
13. Should the given juvenile be treated as an adult because of his quicker mental, physical and emotional development?
14. Did the subject make a true or false confession?
15. Are the victim(s), culprit(s) and the witnesses telling the truth?
16. Does the subject have suicidal tendencies?
17. Are the alleged obscene communications or the phone calls genuine or phony?
18. Is the mental aberration of the subject sufficiently acute to warrant his dispatch to a mental asylum?
19. Does the repeated violence of husband and wife *inter se* indicate marital incompatibility?
20. How can the interests of the child be served best, by giving the custody of the child to mother, to father or to a third party?

In addition, forensic psychology helps to:

1. Identification basis of a subject
2. Identification of the schizophrenic (or the like) persons
3. Building a personality profile of the subject from his writings (psycho-linguistics), action and behaviour while committing the crime; or, from the *modus operandi*.

30.6 COLLECTION OF EVIDENCE

The following are the sources for forensic psychological evidence:

1. Case history studies
2. Covert and overt observations
3. Interviews and interrogations
4. Experiments
5. Research

30.6.1 Case History Studies

In all psychological evaluations, case history study forms the first step towards the goal. This involves the study of the behaviour of the subject in the past for as long a period as possible along with his current behaviour towards all concerned. The sources for the information are mainly:

1. **The family:** parents, brothers and sisters, husband or wife, as the case may be, sons, daughters and relatives living with the family or visiting the family frequently
2. **Family friends:** who know the family and the subject intimately
3. School and college-mates and other friends of the subject
4. Partners, colleagues, superiors and subordinates who frequently meet the subject
5. Club members and its staff, if the subject is a member of the club
6. Contribution and behaviour of the subject in governmental or non-governmental organisations, if he is a member of the organisations

Case studies provide a wealth of information about the behaviour and personality of the subject if the studies are carried out meticulously.

30.6.2 Observations

The case histories of the subject(s) are highly valued in the total evaluations. They are not often complete or truthful because sometimes biased information is given by the interviewees intentionally or otherwise. Besides, they are not professional observers. Consequently, they often miss important details essential to build a correct psychological profile of the subject. Observations by the forensic psychologist are, therefore, essential. The observations are made in all aspects of the subject's life: at home, in the office, in the social dealings, execution of business, and religious activities. The observations have to be spread over a period consistent with the need of the case. However, the limitations imposed by the court and the counsel have to respected. The observations lead to a proper psychological profile.

30.6.3 Interviews and Interrogations

Interviews and interrogations form the backbone of psycho-diagnostic processes. Case studies are good, but the available details are often limited and their trustworthiness is not always certain. Likewise, observations are a good source of information, but they are time-consuming and in actual fieldwork, they are often not practical due to the time and budget constraints. Interviews and interrogations consume less time, and in competent hands, they can work wonders.

The success in interrogation and interviews depends upon if:

1. The psychologist knows the background of the subject and the incident, which has necessitated the psychological appraisal. The psychologist start interviews only after acquiring the information.
2. The psychologist conducts interviews in a relaxed atmosphere.
3. He does not stretch the interview period of the interview to cause boredom, fatigue or depression. Often more than one interview is needed to reach the inner reaches of the subject.
4. The psychologist is able to win his confidence of the subject that he is with him and whatever he is doing is for his benefit.

5. The psychologist understands what ticks the subject and what ticked him to a given action.
6. The psychologist is able to establish a personal rapport with the subject. Once this rapport is achieved the subject opens up and provides all the data to reconstruct his psychological profile to give answers to various questions like why? What for? When? Who? Where? How?

The interviews are conducted in special rooms (clinics) ideally. The room has to be free of all sorts of distractions. No other person other than the psychologist and the subject should be present in the room. If the dialogue is to be recorded, it should be done covertly. Sometimes makeshift arrangement has to be made when the subject is in jail or in a hospital. Even in these situations, the principle of privacy is observed. Some psychologists carry their own tents with them to the site; others requisition them at the site from the authorities of the institutions.

30.6.4 Experimental Approach

Among the various approaches in forensic psychology, the experimental approach provides the most convincing evidence.

> *The first-ever-case of experimental psychology saved a train driver from conviction in a case of train accident. The charge was that the driver failed to stop the train in time and thus caused the death of the victim. Forensic psychologist showed experimentally that the response time in this case was short and the driver could not stop the train given the same speed and distance to stop. The judge appreciated the experiment and acquitted the driver. (CH)*

The nature of the experimental work varies according to the type of the case. The following examples illustrate the nature and effectiveness of experimental approach:

> *In a case of road accident the claimant alleged that he could not use his left leg. An experiment was organised covertly. While he was limping on the road, a cracker was exploded behind his back. The claimant thinking it an explosion of a bomb ran fast. The act of running was videographed (covertly). The video show finished the claimant's claim. (CH)*

> *An airman was charged for acts of omission and commission. He claimed temporary insanity due to influence of drinking. He was made to drink the same quantity of same illicit liquor in the same interval. Not only he became drunk, but he was violent also. In addition, his condition deteriorated so much that he had to be hospitalised for considerable period. On the affidavits of the witnesses who observed the drinking experiment and its aftermath, the charges against him were withdrawn. (CH)*

30.7 PSYCHOLOGY IN INTERROGATION

Police interrogators have been using psychology in their interrogation from time immemorial without involving the name of psychology. They used all types of emotions: fear, hatred, revenge, greed, love, pain in their interrogation to get at the truth. Pain and fright were the most frequently used emotions and they often proved effective in extracting the truth. The interrogator would use III Degree methods to frighten the subject so frequently and so severely that the III degree became most infamous. So much so that even today many suspects die in **"police interrogations"** because of III degree methods. The methods have become so notorious that some innocent people **"confess"** to the crime they have not seen, to avoid police brutality. Thus, pain and fright worked.

With advances in the understanding of human behaviour, forensic psychology developed and its interrogation aspects flourished most conspicuously. Forensic psychology has been in the field of detection of deception, commonly known as lie detection, for about a century now. It has come up in a big way to get at the truth. The following modes are used extensively. Simultaneously they are being refined.

1. **Psycho-physiological Detection of Deception (PDD)**, commonly known as Lie Detection.
2. **Narco-analysis;** Media persons and fiction writers have given it the fancy name 'Truth Serum.
3. **Brain Printing**; Brain Electrical Activated Oscillation (BEAO).
4. **Hypnosis.**
5. **Psychological Stress Evaluator (PSE)**.

30.7.1 Psycho-physiological Detection of Deception (PDD)[2]

The detection of deception is also known as Lie Detection or finding the truth. Psycho-physiological mode of the detection of deception is one big step forward in crime handling. Polygraph is the most frequently used device for lie detection. It is also known as a Lie Detector.

Lie detection process had its origin from the studies of psychosomatic disorders, (also known as psycho-physiological disorders) by psychologists, psychiatrists and physiologists. Psychosomatic disorders are certain disorders of the body, or soma, due to psychological events, such as welling up of strong emotions. The theory emphasises a close relationship between "body" and "mind" and the interaction between the two is named psycho-physiological interaction. The interaction of emotion and body, when a person tells lies, causes certain changes in the body. These changes are detected through instruments and the process is called lie detection by the common man. The other name given to the lie detection is "Psycho-physiological Detection of Deception" (PDD). It can also be named as "Truth Verification".

Although the theory of psychosomatic interaction appears to be a new development, yet historically it is as old as human thinking about mind and matter. There are enough instances where this theory had been successfully applied for medical diagnosis. Now this psychosomatic interaction is extensively used in lie detection or in truth verification.

The term psychosomatic interaction means that when a person faces the problem of answering question(s) relating to a crime in which he is involved has to decide what answer he should give. If he gives true answers his life and liberties will be in jeopardy. He has to coin some lie for self-preservation. In this mental exercise, the individual suffers certain visible and invisible physiological disturbances. The subtle (invisible) ones are detected through instrumental recordings, recorded in the forms of graphs. The evaluations of the graphs indicate the answers, which are lies. Thus, the emotions and thinking of the subject can be visualised from the physiological manifestations and *vice versa*.

The first scientific use of this principle for crime investigation dates back to 1895 when Lombroso conducted experiments on actual criminal suspects and demonstrated that there is a change in the suspect's blood pressure and pulse rate when he tells a lie. From 1914 onwards, the experiments were seriously pursued to establish that the feeling of guilt in a culprit induces fear (fear of exposure and entrapment). It brings in physiological changes. The blood pressure, the pulse rate and the respiration are affected prominently. The experiments also indicated that these reactions are governed by the automatic nervous system of the body and, therefore, lie, generally, beyond the conscious control of most of the individuals.

30.7.2 Psychological Stress Evaluator

Psychological stress evaluator (PSE) is an instrument like the lie detector. It detects the stress on the subject, which he undergoes while telling lies. Part of this stress may be revealed in his

2. For more details see chapter 31, on Detection of Deception.

voice, but mostly it is found in the inaudible vibrations (tremors) which the speaker under stress emits from the voice organs (vocal cord). The instrument records these inaudible tremors and thus indicates the falsehood or truthfulness of his statements.

The subject is asked to answer simple but well-organised questions. Questions which are not related to the crime (Irrelevant Questions), which the subject will answer truthfully, and questions which relate to the crime (Relevant Questions), where the subject tells lies, if he is the culprit. Relevant Questions and Irrelevant Questions are carefully intermingled. The inaudible vibrations are then recorded on a magnetic tape. This tape is then "fed" into the P.S.E. that differentiates truth from falsehood in the same ways as the lie-detector does.

The instrument is claimed to be superior to polygraph. It can be used covertly. It is simpler, less bulky — only a tape recorder need be used during interrogation. A second expert can check/verify the recorded evidence. It can be used to evaluate recorded telephonic conversations.

The P.S.E. has not become popular yet.

30.7.3 Hypnosis

Hypnosis is the process in which the subject (person under interrogation) accepts the suggestion of the hypnotist non-critically. The reasoning faculty of the individual is suppressed.

Hypnosis has been used successfully in medicine. It is being used in the criminal investigation in the following situations:

1. When the victim has forgotten the details due to extreme fright or emotional breakdown.

   In a case of murder (of one girl) and rape (of a second girl), the second was so frightened that she could not give the details of the culprit. She was put under hypnosis. She gave complete details. When the facial features reconstructed from her description given under hypnosis, and the portrait drawn from the description, was shown she at once exclaimed that he was the culprit. (CH).

2. Mendacious witnesses tell the truth under hypnosis.
3. Malingerers, who fake physical injuries, are exposed.
4. Falsehood of a charge preferred against a person can be checked.
5. The culprit, under hypnosis, may disclose the hidden case property/clues, such as *corpus delicti*, *the* weapon of offence.

In addition, hypnosis helps in building character in police officers, toughens in spies and saboteurs, fanaticism among terrorists.

Hypnosis is a double-edged weapon. It can be misused by the criminals:

1. Persons can be induced to commit crime under the hypnotic suggestion — the extent to which a subject can go depends upon the personalities of the subject and the hypnotist, especially on the latter's skill.

   In a recent case, a Tantaric inveigled a rich widow to become his disciple. With passage of time, he not only won her complete confidence but became intimate also. The Guru had an eye on her property. He hypnotised her so well that she got his name entered as the authorised person to operate her bank lockers also. In addition, he got a sale deed of her flat executed in his favour without paying any money. Later he persuaded her to create a trust of her vast landed property. He got himself nominated as the chief executive of the trust. At this stage the hypnotic spell went off. She hauled up the Tantaric in the courts to recover her property. (CH)

2. Persons can be hypnotized to gift away their property.
3. Persons can be induced to give false confessions, false *alibi*, or made to forget certain events, including criminal acts, like forgeries.
4. Hypnosis is being used to inveigle the Fidayeen to form suicide bombers on large scale.

Hypnosis has yet to travel a long way to become an accepted technique in police investigations in India. However, the potential is unlimited. It is especially useful where children, women and nervous persons are involved as victims or witnesses. They perform better under hypnosis.

30.7.4 Narco-analysis[3]

It is believed that if a person is administered a drug which suppresses his reasoning power without affecting memory and speech, he can be made, to tell the truth. Some drugs have been found to create this twilight state in some persons. These drugs are being administered in some countries including India.

Truth serums (or sera) are no serum at all. They are drugs, sometimes used clinically. A few of the best-known drugs are Sodium Pentothal, Sodium Amytal, Seconal, Hyoscine (scopolamine), Phenobarbital. These drugs are administered through injections. They produce a state of semi-conscious in the subject. The reasoning faculty of the individual is suppressed.

Truth drug administration suffers from many drawbacks. *Firstly*, the person to administer them has to be a highly qualified physician. *Secondly*, it is always difficult to determine the correct dose of the drug. It varies with the physical constitution of the subject, his mental attitude, will power and the habituation. Besides, the clever subjects hoodwink the operator by pretending that he is in the state of semi-consciousness. He then tell lies, which are useful to him and which mislead the investigator.

Truth drugs have never been popular in police interrogation anywhere, till recently. They have now being used extensively in important cases. They were used to interrogate spies only where dose could be changed and correct dose found by experiment especially when the instrumental methods have failed to extract the truth. Now Narco-analysis is being used in cases where other techniques proved ineffective. *Nithari Serial murders* case, *Telgi's super stamp scam* case, Abu Salem's 1993 Mumbai blast case and many other cases have brought Narco-analysis in limelight. The recent judgment of the Supreme Court has regulated the test. The consent of the subject has been made essential for the test. The judgment has conferred respectability to the test. It will flourish and thus reduce the number of cases where torturous III degree methods are used.

30.7.5 Brain Printing/Profiling

Brain printing/profiling is based upon the study of the brain's additional electrical activities, stimulated by the visual recognition of familiar associative evidence. The created additional electrical activities indicate that the subject has recognised the given object. An instrument, Encephalograph, has been developed and patented to study these electrical activities.

When a culprit, victim or witness is shown an object, a scene or a situation, which is connected with the crime, his brain recognises the entity. Recognition creates activity in the brain. This activity is recorded by Encephalograph and the trace thus obtained is called Electroencephalogram (EEG).

The brain printing can provide useful information if the following basics are met with:

1. There should be a reliable measure to record the brain stimulation — this has been achieved through electroencephalograph (EEG).
2. The existence or absence of the information with the subject. It is indicated by the response of the subject in the electroencephalograph.

3. See chapter 32 on Narco-analysis.

3. Brain printing is based upon the premise that the individual cannot control his brain activity. The correctness or otherwise of the premise has not been proved so far.

30.7.5.1 Importance

The brain is a storehouse of all the information a subject possesses. If the subject is involved in a particular activity, he has the information stored in his brain. All the criminals and their associates have information about their criminal acts. Therefore, if we can reach this information in the brain, we can establish their involvement or innocence and also the part played by them in a particular act. Thus, it can provide foolproof evidence against them without external sources such as written or oral evidence. As brain of the culprit always records the occurrence, therefore the evidence is always available. Recent advances in neuro-sciences have given a ray of hope that the stored information in the brain can be tapped accurately, non-invasively and objectively which can provide clinching evidence in a crime situation. However, the techniques involved need a lot of spadework before they can provide through brain printing. It will be a big break-through (perhaps the biggest) in scientific criminal investigations.

According to its protagonists it is useful specifically in:

1. White collar crimes
2. Burglary and theft cases
3. Offences against person, including murder and rape cases
4. Identification of terrorist, saboteurs, spies, arsonist.
5. Identification of potential criminals/crime situations

The advantages of the technique are claimed to be:

1. Always available evidence
2. Accurate
3. Cost effective
4. Time effective
5. Non-invasive
6. Quick
7. No subjective element (computer process the details and interpretation) hence no bias
8. Human-right savvy

30.7.5.2 Process

The process of brain printing is simple. It involves:

1. Sensors are strapped around the head in the form of a band.
2. A number of pictures (crime-relevant/crime-irrelevant) are shown to the subject. The culprit's involvement is indicated by the electrical activity of the brain when crime related pictures are shown. The subject should show no additional brain electrical activities when non-crime related pictures are shown. The innocence of the subject is proved by the absence of the electrical activities when the subject is shown the mixed pack of pictures.

3. The brain activity is picked up by the sensors and recorded in a computer in a waveform. The electrical activity changes if the subject recognises any familiar object, action or word at the screen.
4. The analysis of the changes in the wave pattern indicates whether the subject recognised the particular object, action or word, relevant to the crime and shown on the TV screen or not. If the subject was the culprit or a partner, he would recognise the item and the fact is found from the waveform. If the subject is innocent the item would not stimulate brain activity and hence no additional electrical activity will take place. In this process, unlike the polygraph method, no questions are asked.

Brain printing technique to collect evidence is highly attractive. However, there are many rough corners which need smoothing before it becomes a respectable routine technique in the criminal justice system.

In India, Forensic Psychology is making its mark in criminal investigation and trials and thus helping dissemination of justice in a better way. Its tremendous potentiality is bound to make inroads and gets its rightful place in the criminal justice system. There is no doubt that Forensic Psychology is a potent weapon in the fight against crime and handling criminals, to reduce their number, to induce them to follow the path on the right side of the law. The younger generations are finding it tough to compete, to be one with the Joneses and to lead a satisfied life. The society has lost faith in religion and social values. They are increasingly marching towards crime. They need help to avoid downhill slide. Psychology, in general, and Forensic Psychology, in particular, can and has to help to avoid the fall.

30.8 ADDITIONAL READINGS

1. Arrigo, BA, *Introduction to Forensic Psychology,* Academic Press, New York, London.
2. Veeraraghavan, V, *Handbook of Forensic Psychology,* SBB Publishers, New Delhi.

30.9 CASE LAW

30.9.1 SC on Narco-analysis/Polygraph/Brain Electrical Activation (Beap) Tests[4]

Author's Summary

This is an unfortunate negative landmark SC judgment on noetic sciences, namely, *polygraph/ /narco-analysis/the Brain Electrical Activation Profile (BEAP)* tests. It disallowed their effective use as evidence in courts and allowed their use in investigation only, subject to the consent of the accused.

The ruling, thereby, tacitly allowed the investigators to use their traditional III Degree modes in interrogation. It, thus, promote inhuman treatment of the suspect under interrogation.

The SC has ruled that for voluntary use of these scientific tests, the guideline provided by the Human Right Commission must be followed scrupulously.

1. The legal questions in this batch of criminal appeals relate to the involuntary administration of certain scientific techniques, namely narcoanalysis, **polygraph examination and the Brain**

4. *Mst. Selvi v State of Karnataka,* AIR 2010 SC 1974 : 2010 AIR SCW 3011 : (2010) 7 SCC 263.

Electrical Activation Profile (BEAP) test for the purpose of improving investigation efforts in criminal cases.

1. This issue has received considerable attention since it involves tensions between the desirability of efficient investigation and the preservation of individual liberties. Ordinarily the judicial task is that of evaluating the rival contentions in order to arrive at a sound conclusion. However, the present case is not an ordinary dispute between private parties. It raises pertinent questions about the meaning and scope of fundamental rights which are available to all citizens. Therefore, we must examine the implications of permitting the use of the impugned techniques in a variety of settings.

2. Objections have been raised in respect of instances where individuals who are the accused, suspects or witnesses in an investigation have been subjected to these tests without their consent. Such measures have been defended by citing the importance of extracting information which could help the investigating agencies to prevent criminal activities in the future as well as in circumstances where it is difficult to gather evidence through ordinary means. In some of the impugned judgments, reliance has been placed on certain provisions of the Code of Criminal Procedure, 1973 and the Indian Evidence Act, 1872 to refer back to the responsibilities placed on citizens to fully co-operate with investigation agencies. It has also been urged that administering these techniques does not cause any bodily harm and that the extracted information will be used only for strengthening investigation efforts and will not be admitted as evidence during the trial stage. The assertion is that improvements in fact-finding during the investigation stage will consequently help to increase the rate of prosecution as well as the rate of acquittal. Yet another line of reasoning is that these scientific techniques are a softer alternative to the regrettable and allegedly widespread use of 'third degree methods' by investigators.

3. The involuntary administration of the impugned techniques prompts questions about the protective scope of the 'right against self-incrimination' which finds place in Article 20(3) of our Constitution. In one of the impugned judgments, it has been held that the information extracted through methods such as 'polygraph examination' and the 'Brain Electrical Activation Profile (BEAP) test' cannot be equated with 'testimonial compulsion' because the test subject is not required to give verbal answers, thereby falling outside the protective scope of Article 20(3). It was further ruled that the verbal revelations made during a narcoanalysis test do not attract the bar of article 20(3) since the inculpatory or exculpatory nature of these revelations is not known at the time of conducting the test. To address these questions among others, it is necessary to inquire into the historical origins and rationale behind the 'right against self-incrimination'. The principal questions are whether this right extends to the investigation stage and whether the test results are of a 'testimonial' character, thereby attracting the protection of Article 20(3). Furthermore, we must examine whether relying on the test results or materials discovered with the help of the same creates a reasonable likelihood of incrimination for the test subject.

4. We must also deal with arguments invoking the guarantee of 'substantive due process' which is part and parcel of the idea of 'personal liberty' protected by article 21 of the Constitution. The first question in this regard is whether the provisions in the Code of Criminal Procedure, 1973 that provide for 'medical examination' during the course of an investigation can be read expansively to include the impugned techniques, even though the latter is not explicitly enumerated. To answer this question, it will be necessary to discuss the principles governing the interpretation of statutes in light of scientific advancements. Questions have also been raised with respect to the professional ethics of medical personnel involved in the administration of these techniques. Furthermore, article 21 has been judicially expanded to include a 'right against cruel, inhuman or degrading treatment', which requires us to determine whether the involuntary administration of the impugned techniques violates this

right whose scope corresponds with evolving international human rights norms. We must also consider contentions that have invoked the test subject's 'right to privacy', both in a physical and mental sense.

5. The scientific validity of the impugned techniques has been questioned and it is argued that their results are not entirely reliable. For instance, the narcoanalysis technique involves the intravenous administration of sodium pentothal, a drug which lowers inhibitions on part of the subject and induces the person to talk freely. However, empirical studies suggest that the drug-induced revelations need not necessarily be true. Polygraph examination and the BEAP test are methods which serve the respective purposes of lie-detection and gauging the subject's familiarity with information related to the crime. These techniques are essentially confirmatory in nature, wherein inferences are drawn from the physiological responses of the subject. However, the reliability of these methods has been repeatedly questioned in empirical studies. In the context of criminal cases, the reliability of scientific evidence bears a causal link with several dimensions of the right to a fair trial such as the requisite standard of proving guilt beyond

'Brain Electrical Activation Profile test',

…..also known as the **'P300 Waves test'**. It is a process of detecting whether an individual is familiar with certain information by way of measuring activity in the brain that is triggered by exposure to selected stimuli. This test consists of examining and measuring 'event-related potentials' (ERP), *i.e.*, electrical wave forms emitted by the brain after it has absorbed an external event. An ERP measurement is the recognition of specific patterns of electrical brain activity in a subject that are indicative of certain cognitive mental activities that occur when a person is exposed to a stimulus in the form of an image or a concept expressed in words. The measurement of the cognitive brain activity allows the examiner to ascertain whether the subject recognised stimuli to which he/she was exposed. [Cited from: Andre A Moenssens, '*Brain Fingerprinting - Can it be used to detect the innocence of persons charged with a crime?*' 70 University of Missouri at Kansas City Law Review 891-920 (Summer 2002) at p. 893]

By the late 19th century it had been established that the brain functioned by emitting electrical impulses and the technology to measure them was developed in the form of the electroencephalograph (EEG) which is now commonly used in the medical field. Brain wave patterns observed through an EEG scan are fairly crude and may reflect a variety of unrelated brain activity functions. It was only with the development of computers that it became possible to sort out specific wave components on an EEG and identify the correlation between the waves and specific stimuli. The P300 wave is one such component that was discovered by Dr. Samuel Sutton in 1965. It is a specific event-related brain potential (ERP) which is triggered when information relating to a specific event is recognised by the brain as being significant or surprising.

The P300 waves test is conducted by attaching electrodes to the scalp of the subject, which measure the emission of the said wave components. The test needs to be conducted in an insulated and air-conditioned room in order to prevent distortions arising out of weather conditions. Much like the narcoanalysis technique and polygraph examination, this test also requires effective collaboration between the investigators and the examiner, most importantly for designing the stimuli which are called 'probes'. Ascertaining the subject's familiarity with the 'probes' can help in detecting deception or to gather useful information. The test subject is exposed to auditory or visual stimuli (words, sounds, pictures, videos) that are relevant to the facts being investigated alongside other irrelevant words and pictures. Such stimuli can be broadly classified as material 'probes' and neutral 'probes'. The underlying theory is that in the case of guilty suspects, the exposure to the material probes will lead to the emission of P300 wave components which will be duly recorded by the instruments. By examining the records of these wave components the examiner can make inferences about the individual's familiarity with the information related to the crime. [Refer: Laboratory Procedure Manual –

Brain Electrical Activation Profile (Directorate of Forensic Science, Ministry of Home Affairs, Government of India, New Delhi - 2005)]

The P300 wave test was the precursor to other neuroscientific techniques such as 'Brain Fingerprinting developed by Dr. Lawrence Farwell. The latter technique has been promoted in the context of criminal justice and has already been the subject of litigation. There is an important difference between the 'P300 waves test' that has been used by Forensic Science Laboratories in India and the 'Brain Fingerprinting' technique. Dr. Lawrence Farwell has argued that the P300 wave component is not an isolated sensory brain effect but it is part of a longer response that continues to take place after the initial P300 stimulus has occurred. This extended response bears a correlation with the cognitive processing that takes place slightly beyond the P300 wave and continues in the range of 300-800 milliseconds after the exposure to the stimulus. This extended brain wave component has been named as the MERMER (Memory-and-Encoding-Related-Multifaceted-Electroencephalographic Response) effect. [*See* generally: Lawrence A. Farwell, '*Brain Fingerprinting: A new paradigm in criminal investigations and counter-terrorism*', (2001) Text can be downloaded from <www.brainwavescience.com>]

71. Functional Magnetic Resonance Imaging (FMRI) is another neuroscientific technique whose application in the forensic setting has been contentious. It involves the use of MRI scans for measuring blood flow between different parts of the brain which bears a correlation to the subject's truthfulness or deception. FMRI-based lie-detection has also been advocated as an aid to interrogations in the context of counter-terrorism and intelligence operations, but it prompts the same legal questions that can be raised with respect to all of the techniques mentioned above. Even though these are non-invasive techniques the concern is not so much with the manner in which they are conducted but the consequences for the individuals who undergo the same. The use of techniques such as 'Brain Fingerprinting' and 'FMRI-based Lie-Detection' raise numerous concerns such as those of protecting mental privacy and the harms that may arise from inferences made about the subject's truthfulness or familiarity with the facts of a crime. [*See* generally: Michael S. Pardo, *'Neuroscience evidence, legal culture and criminal procedure*', 33 *American Journal of Criminal Law* 301-337 (Summer 2006); Sarah E. Stoller and Paul Root Wolpe, *'Emerging neurotechnologies for lie detection and the fifth amendment',* 33 *American Journal of Law and Medicine* 359-375 (2007)].

72. These scientific techniques could also find application outside the criminal justice setting. For instance, Henry T. Greely (2005, Cited below) has argued that technologies that may enable a precise identification of the subject's mental responses to specific stimuli could potentially be used for market-research by business concerns for surveying customer preferences and developing targeted advertising schemes. They could also be used to judge mental skills in the educational and employment-related settings since cognitive responses are often perceived to be linked to academic and professional competence. One can foresee the potential use of this technique to distinguish between students and employees on the basis of their cognitive responses. There are several other concerns with the development of these 'mind-reading' technologies especially those relating to the privacy of individuals. [Refer: Henry T. Greely, 'Chapter 17: The social effects of advances in neuroscience: Legal problems, legal perspectives', in Judy Illes (editor), *Neuro-ethics* – Defining the issues in theory, practice and policy (Oxford University Press, 2005) at pp. 245-263] 73. Even though the P300 Wave component has been the subject of considerable research, its uses in the criminal justice system have not received much scholarly attention. Dr. Lawrence Farwell's 'Brain Fingerprinting' technique has attracted considerable publicity but has not been the subject of any rigorous independent study. Besides this preliminary doubt, an important objection is centred on the inherent difficulty of designing the appropriate 'probes' for the test. Even if the 'probes' are prepared by an examiner who is thoroughly familiar with all aspects of the facts being investigated, there is always a chance that a subject may have had prior exposure to the material

probes. In case of such prior exposure, even if the subject is found to be familiar with the probes, the same will be meaningless in the overall context of the investigation. For example, in the aftermath of crimes that receive considerable media-attention the subject can be exposed to the test stimuli in many ways. Such exposure could occur by way of reading about the crime in newspapers or magazines, watching television, listening to the radio or by word of mouth. A possibility of prior exposure to the stimuli may also arise if the investigators unintentionally reveal crucial facts about the crime to the subject before conducting the test. The subject could also be familiar with the content of the material probes for several other reasons.

74. Another significant limitation is that even if the tests demonstrate familiarity with the material probes, there is no conclusive guidance about the actual nature of the subject's involvement in the crime being investigated. For instance, a by-stander who witnessed a murder or robbery could potentially be implicated as an accused if the test reveals that the said person was familiar with the information related to the same. Furthermore, in cases of amnesia or 'memory-hardening' on part of the subject, the tests could be blatantly misleading. Even if the inferences drawn from the 'P300 wave test' are used for corroborating other evidence, they could have a material bearing on a finding of guilt or innocence despite being based on an uncertain premise. [For an overview of the limitations of these neuroscientific techniques, *see*: John G. New, 'If you could read my mind - Implications of neurological evidence for twenty-first century criminal jurisprudence', 29 Journal of Legal Medicine 179-197 (April-June 2008)].

30.10 CONCLUSION

221. In our considered opinion, the compulsory administration of the impugned techniques violates the 'right against self-incrimination'. This is because the underlying rationale of the said right is to ensure the reliability as well as voluntariness of statements that are admitted as evidence. This Court has recognised that the protective scope of Article 20(3) extends to the investigative stage in criminal cases and when read with section 161(2) of the Code of Criminal Procedure, 1973 it protects accused persons, suspects as well as witnesses who are examined during an investigation. The test results cannot be admitted in evidence if they have been obtained through the use of compulsion. Article 20(3) protects an individual's choice between speaking and remaining silent, irrespective of whether the subsequent testimony proves to be inculpatory or exculpatory. Article 20(3) aims to prevent the forcible 'conveyance of personal knowledge that is relevant to the facts in issue'. The results obtained from each of the impugned tests bear a 'testimonial' character and they cannot be categorised as material evidence.

222. We are also of the view that forcing an individual to undergo any of the impugned techniques violates the standard of 'substantive due process' which is required for restraining personal liberty. Such a violation will occur irrespective of whether these techniques are forcibly administered during the course of an investigation or for any other purpose since the test results could also expose a person to adverse consequences of a non-penal nature. The impugned techniques cannot be read into the statutory provisions which enable medical examination during investigation in criminal cases, *i.e.* the Explanation to sections 53, 53A and 54 of the Code of Criminal Procedure, 1973. Such an expansive interpretation is not feasible in light of the rule of '*ejusdem generis*' and the considerations which govern the interpretation of statutes in relation to scientific advancements. We have also elaborated how the compulsory administration of any of these techniques is an unjustified intrusion into the mental privacy of an individual. It would also amount to 'cruel, inhuman or degrading treatment' with regard to the language of evolving international human rights norms. Furthermore, placing reliance on the results gathered from these techniques comes into conflict with the 'right to fair trial'. Invocations of a compelling public interest cannot justify the dilution of constitutional rights such as the 'right against self-incrimination'.

> 223. *In light of these conclusions, we hold that no individual should be forcibly subjected to any of the techniques in question, whether in the context of investigation in criminal cases or otherwise. Doing so would amount to an unwarranted intrusion into personal liberty. However, we do leave room for the voluntary administration of the impugned techniques in the context of criminal justice, provided that certain safeguards are in place. Even when the subject has given consent to undergo any of these tests, the test results by themselves cannot be admitted as evidence because the subject does not exercise conscious control over the responses during the administration of the test. However, any information or material that is subsequently discovered with the help of voluntary administered test results can be admitted, in accordance with section 27 of the Evidence Act, 1872.*

The National Human Rights Commission had published 'Guidelines for the Administration of Polygraph Test (Lie Detector Test) on an Accused' in 2000. These guidelines should be strictly adhered to and similar safeguards should be adopted for conducting the 'Narcoanalysis technique' and the 'Brain Electrical Activation Profile' test. The text of these guidelines has been reproduced below:

(i) No Lie Detector Tests should be administered except on the basis of the consent of the accused. An option should be given to the accused whether he wishes to avail such test.

(ii) If the accused volunteers for a Lie Detector Test, he should be given access to a lawyer and the physical, emotional and legal implication of such a test should be explained to him by the police and his lawyer.

(iii) The consent should be recorded before a Judicial Magistrate.

(iv) During the hearing before the Magistrate, the person alleged to have agreed should be duly represented by a lawyer.

(v) At the hearing, the person in question should also be told in clear terms that the statement that is made shall not be a 'confessional' statement to the Magistrate but will have the status of a statement made to the police.

(vi) The Magistrate shall consider all factors relating to the detention including the length of detention and the nature of the interrogation.

(vii) The actual recording of the Lie Detector Test shall be done by an independent agency (such as a hospital) and conducted in the presence of a lawyer.

(viii) A full medical and factual narration of the manner of the information received must be taken on record.

Reasonable doubt and the right of the accused to present a defence. We must be mindful of the fact that these requirements have long been recognised as components of 'personal liberty' under article 21 of the Constitution. Hence it will be instructive to gather some insights about the admissibility of scientific evidence.

30.10.1 Insanity as Defence[5]

We may briefly notice the evidence bearing on the plea of insanity. Since 1958 the appellant was an employee in the Stores Branch of the Northern Railway Headquarters in Baroda House, New Delhi. In 1958 and 1959 he had altercations with other clerks in the office. On May 20, 1959 his superior officer observed that he was prone to lose temper in no time. In his moments of excitement he became dangerous and used to hit his colleagues with anything that he could lay his hands on. But at the time of his greatest excitement he could distinguish between

5. *Jai Lal v Delhi Administration*, AIR 1969 SC 15 : (1969) 1 SCR 140.

right and wrong. After May, 1959 he worked at his desk as a normal man. In March, 1960 he again quarrelled with another clerk. He was suspended and sent for medical examination. At this stage he was suffering from mental illness. On October 12, 1960 he was examined by a psychiatrist who found that he exhibited symptoms of acute schizophrenia and showed disorder of thought, emotion and perception of external realities. The psychiatrist said that he was harbouring certain delusions. The nature of the delusions is not stated. It is not proved particular delusion or hallucination. The appellant was put on a drug named Largactil and was given convulsive electro-theraphy treatment. On January 12, 1961 he was cured of his illness and was advised to join his duties. On resuming his duties the appellant worked in the office in the normal manner.

There is some evidence that on the morning of November 25, 1961 and the preceding night, the appellant complained that he was unwell and took medicine. But on the morning of November 25, he went to his office as usual. He was late in attendance and was marked absent. He applied in writing for one day's casual leave stating that he had an urgent piece of work at home. Nobody noticed any symptoms of mental disorder at that time. He left the office at about 11.30 a.m. and returned home alone. At 1.45 p.m. he stabbed Leela, Parbati and Raghubir with a knife. He concealed the knife and a search for it has proved fruitless. At 2.45 P.M. the investigating officer arrived on the spot, arrested the appellant and interrogated him. He was then found normal and gave intelligent answers. On the same date, he was produced before a magistrate. His brother was then present but the magistrate was not informed that he was insane. On November 27, he was interrogated by an inspector. It does not appear that he was then insane.

On November 30, the appellant's brother filed an application before the committing magistrate stating that the appellant was insane at the time of the occurrence. The appellant was later remanded to judicial custody. On receipt of another application from his brother he was kept under medical observation from December 16 to December 23. On December 19 the medical officer noted that the appellant was indifferent to his surroundings and personal cleanliness, preoccupied in his thoughts muttering to himself, making meaningless gestures, losing track of conversations, given to delayed and repetitive answers and unable to give a detailed account of incidents leading to his arrest. On December 23, he was declared to be a lunatic though not violent. The psychiatrist noted that the appellant had a relapse of schizophrenia and was suffering from disorder of thought, emotion and loss of contact with realities. From his attitude and manner of talk he was found to be aggressive. On September 6, 1962 the psychiatrist reported that the appellant was cured and was in a position to understand proceedings in court. The commitment order was made on January 4, 1963. The trial started in February 1963. The appellant was sane at the time of the trial.

The group of ailments dubbed schizophrenia is discussed in James D. Page's *Abnormal Psychology,* Ch. XI, pages 236 to 261 and Modi's *Medical Jurisprudence and Toxicology,* 14th Ed., pages 349 to 401. Schizophrenia is a general term referring to a group of severe mental disorders marked by a splitting or disintegration of the personality. The most striking clinical features include general psychological disharmony, emotional impoverishment, the dilapidation of thought processes, absence of social rapport, delusions, hallucinations and peculiarities of conduct.

The question is whether the appellant is criminally responsible for the acts done on November 25, 1961. Section 84 of the Indian Penal Code says:

> *Nothing is an offence which is done by a person who, at the time of doing it, by reason of unsoundness of mind, is incapable of knowing the nature of the act, or that he is doing what is either wrong or contrary to law.*

To establish that the acts done are not offences under section 84 it must be proved clearly that at the time of the commission of the act the appellant by reason of unsoundness of mind was incapable of either knowing that the acts were either morally wrong or contrary to law.

The question is whether the appellant was suffering from such incapacity at the time of the commission of the acts. On this question, the state of his mind before and after the crucial time is relevant. There is evidence of a medical character that between October 12, 1960 and January 12, 1961 he was suffering from schizophrenia. He was completely cured of this disease on January 12, 1961 when he resumed his normal duties. He had another attack of this disease in the middle of December, 1961. The attack lasted till September, 1962 when he was found to be normal again. But it is to be observed that the defence witnesses do not say that even during these two periods the appellant was incapable of discriminating between right and wrong or of knowing the physical nature of the acts done by him.

After the appellant was cured of the disease on January 12, 1961 he was found to be normal. He had a highly strong temperament and was easily excitable. But there is positive evidence that even at the moment of his greatest excitement he could distinguish between right and wrong. From January 12, upto November 24, 1961 he attended his office and discharged his duties in a normal manner. On the morning of November 25, 1961 his mind was normal. He went to and from his office all along. He wrote a sensible application asking for casual leave for one day. At 1.45 P.M. he gave normal and intelligent answers to the investigating officers. Nothing abnormal in him was noticed till December 16, 1961.

The thing in favour of the appellant is that though he had a motive for attacking Baburam, no clear motive for attacking the child Leela or Parbati is discernible. But there is clear evidence to show that he knew that his act of stabbing and killing was wrong and contrary to law. He concealed the weapon of offence. The knife could not be recovered in spite of searches. He bolted the front door of his house to prevent arrest. He then tried to run away by the back door. When an attempt was made to apprehend him he ran back to his house and bolted the door. He then tried to disperse the crowd by throwing brickbats from the roof. His conduct immediately after the occurrence displays consciousness of his guilt. He knew the physical nature of stabbing. He knew that the stabbing would kill and maim his victims. On a comprehensive review of the entire evidence the two courts below concurrently found that the defence of insanity under section 84 was not made out. We are unable to say that the verdict of the courts below is erroneous.

If a person by reason of unsoundness of mind is incapable of knowing the nature of the act or that he is doing what is either wrong or contrary to law he cannot be guilty of any criminal intent. Such a person lacks the requisite *mens rea* and is entitled to an acquittal. But it is not established in the present case that the appellant was suffering from this incapacity. The general burden is on the prosecution to prove beyond reasonable doubt not only the *actus reus* but also the *mens rea.* The prosecution satisfactorily discharged this burden. The appellant was not insane at the time of the killing and stabbing and he knew the consequences of his acts. We must hold that he is criminally responsible for the acts.

In the result, the appeal is dismissed.

CHAPTER 31

PSYCHOLOGICAL DETECTION OF DECEPTION (PDD) (LIE DETECTION)

SYNOPSIS

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31.1 GENERAL

Detection of deception via psychophysiological interaction is common all over the world. Thought processes bring in both visible and invisible physiological changes. In old days, only visible changes were utilised to detect deception. Invisible body changes such as changes in heartbeat, blood pressure, breathing etc. came to be associated with thought processes only at the end of the nineteenth century. Twentieth-century saw the use of these subtle body changes for detection of deception increasingly. They are detected through instrumental techniques. These changes in the body take place when the subject is stressed to suppress the truth intentionally in situations where the subject believes that by suppressing the truth he is likely to gain or save himself from the adverse consequence(s) of telling the truth.

Psycho-physiological detection of deception, also known as lie detection or truth verification, is a big leap forward in crime handling. The most important and frequently used mode in the detection is use of an instrument known as Polygraph or Lie Detector. In addition to the police and defence departments, it is being used extensively by many industries, banks, insurance companies and other organisations.

During the early years of 20th century psychosomatic disorders, also known as psycho-physiological disorders were studied a good deal by psychologists, psychiatrists and physiologists.

"Psychosomatic disorders" are certain disorders of the body or soma, which are due to psychological events, such as welling up of strong emotions. The psychosomatic theorists believe that a close relationship between "body" and "mind" exists and the interaction between the two is psycho-physiological interaction. The interaction of emotions and body, when a person tells lies, causes certain changes in the body as seen above, both visible, and invisible. The latter is more subtle and autonomic. They are detected through instruments and the process is called lie detection by the common man; or, "Psycho-physiological Detection of Deception" (PDD) by the psychologists. "Truth Verification" or "Detection of Truth" is also an appropriate name for the process.

Although the theory of psychosomatic interaction appears to be a new development, yet historically it is as old as human thinking about mind and matter. There are enough instances where this theory had been applied successfully for medical diagnosis. Now this psychosomatic interaction is extensively used in lie detection of deception (or truth verification).

The rationale behind the principle is that when a person faces the problem of answering question(s) relating to a crime in which he is involved, he has to decide what answer he should give. He is worried that a truthful answer would attract punishment. He cannot give truthful answer(s) as that would put his life and liberties in jeopardy. He, therefore, has to coin some lie for self-preservation. This mental conflict brings in certain visible and invisible physiological disturbances. The subtle (invisible) ones are detected through instrumental recordings, recorded in the forms of graphs. Thus, the emotions and thinking of the subject are visualised from the physiological manifestations. The evaluations of the graphs indicate their truthful or false nature.

The first scientific use of this principle for crime investigation dates back to 1895 when Lombroso conducted experiments on actual criminal suspects and demonstrated that there is a change in the suspect's blood pressure and pulse rate when he tells a lie. From 1914 onwards, the experiments were pursued more seriously and intensively to establish that the feeling of guilt in a culprit induces fear (of exposure and punishment). The fear, in turn, brings in physiological changes in blood pressure, the pulse rate and the respiration prominently. The experiments also indicated that these reactions are governed by the autonomic nervous system of the body and, therefore, lie, generally, beyond the conscious control of almost all individuals.

The initial polygraph (lie detector) was, in fact, a product of these early experiments. It was, however, around 1920 that Larson and Keeler, for the first time, independently developed instruments, which came to be known as a polygraph. The instrument could simultaneously record an individual's blood pressure, pulse rate and respiration during interrogation. Keeler further refined the instrument by adding the electro-dermal galvanometer to record the electrical resistance of the skin (GSR). It is this version of the instrument, which constitutes the traditional polygraph.

31.2 SCIENTIFIC BASIS

The traditional polygraph works on the principle that perception or consciously held feelings of guilt produce a Defence Mechanism to ward off the impending punishment for the crime. The fear of detection and punishment induces a person to tell lies. This psychological phenomenon causes mental excitation. It is manifested in the form of physiological changes in blood pressure, pulse rate, respiration rate and in the Galvanic (electrical) Skin Resistance, (GSR). Physiologically the effort put forth by the individual in an attempt to conceal the excitation, known as a defence mechanism, stimulates the adrenal glands. The stimulated

adrenal glands secrete the hormone adrenaline, which on entering the bloodstream steps up the blood pressure, pulse rate and respiration of the individual.

The defence mechanism process, briefly, involves the following aspects:

1. The subject is asked about the crime he has committed. He knows that if he answers the question truthfully, he would be punished for the same.
2. He wants to tell lies to avoid punishment.
3. His mental faculties set in to find lies to substitute the truth. Psychologists name this shielding process as 'Defence Mechanism'.
4. The Defence Mechanism (shielding process) interacts with the body and creates physiological changes in the form of increased blood pressure, increased respiration rate, increased heartbeat and lower Galvanic Skin Resistance (GSR).
5. The examiner records the responses simultaneously on a graph paper or in the computer along with the response to neutral questions interspersed in the questionnaire.
6. The psychologist who carried out the interrogation, personally evaluates the responses or he uses computer to evaluate the results.

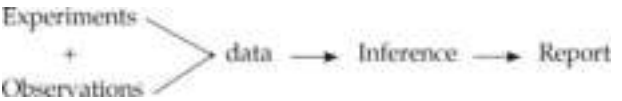
31.3 INTERROGATION

The psychological detection of detection, for successful interrogation, needs a highly sensitive instrument. In addition, other essentials are:

31.3.1 The Examiner

The following features are the hallmarks of an acceptable examiner:

1. **Educational background:** the examiner should have at least a master's degree in Psychology. A Ph. D. inspires greater confidence (Research degree!). Specialisation in Forensic Psychology in an academic career is an additional feather in the cap of the specialist.
2. **Training**; the examiner must have received his basic training from a reputed institution.
3. **Attachment**; the examiner must have been attached to a seasoned Forensic Psychologist for a considerable length of time.
4. **Working experience**; it is indispensable. This is gained through joint examination and issuing joint reports with a senior Forensic Psychologist reporting examiner, for at least fifty cases.
5. Integrity; integrity of the examiner must be above board. His opinion or report must come through the scientific acid test:



31.3.2 The Subject

The examiner must ensure that the subject is in good mental and physical health at the time of polygraph examination

- He is not tired or exhausted. He has not been kept hungry or subjected to physical abuse.
- He is not under the influence of drugs or liquor.

- He has no physical or mental illness.
- He is not nervousness. He is stabilized to the environment by talking to him on matters other than the crime in hand.
- He has given informed consent.

31.3.3 Preparation for Interrogation

The examiner has to do his homework before he can start interrogation. The preparation involves the following elements:

1. **Proper interrogation room:** the set-up of interrogation room plays an important role in achieving accuracy in deception tests. The interrogation is carried out in a Spartan room with one door maximum one window; more or less sound proof, no wall decorations, no bright lighting, no table lamp, no telephone. Only items present in the room are Lie Detector and audio and video recording devices, placed unobtrusively, but not hidden. There is a one-way mirror fitted to the window. It allows a lawyer his client/proceedings through the mirror. The sitting arrangement is for two persons only: the suspect and the examiner. One to one (1:1) arrangement ensures privacy and makes the subject feel at ease.
2. **Background knowledge of the case:** The examiner must know all the facts of the case before starting the interrogation. He usually studies the following documents for the purpose:
   - FIR and inspection report of the scene along with site plan (sketch), photographs and video film of the scene.
   - Statements of the accused, the victim and the witnesses
   - Medico-legal reports of the accused and the victim, if any.
   - Post-mortem report of the victim in case of murder
   - Medical history of the accused, if any
   - Informed consent of the accused[1].
3. **Conference with the investigator:** the conference is essential to understand the case and the needs of the case, to get additional information and to remove informational ambiguities, if any.
4. **Pre-interrogation interview of the subject:** The interview is essential for the interrogator to:
   - Establish a rapport with the subject, to achieve trust/cooperation.
   - Stabilize the subjects, who are usually nervous.
   - 'Acclimatize' the subject with the environment of the interrogation room. The subjects sits in the room for a few minutes, observe the surroundings. There is not much to observe in the room, as it is minimally furnished and not cluttered with office paraphernalia.
   - Familiarize the subject with the interrogation process; its scope, its potentialities, its limitations and expected results so that the usual fear and nervousness of the subject vanishes.

1. The Supreme Court has made it mandatory vide judgment: in the case, *Mst. Selvi v State of Karnataka*, AIR 2010 SC 1974 : 2010 AIR SCW 3011 : (2010) 7 SCC 263.

- Inform the subject about the process of interrogation.
- Assess the subject for any abnormality/peculiarity.
- Assess the subject's memory.
- Get the subject's version of the episode and understand its differences from the prosecution version?
- Ascertain the subject's tendency to conceal facts.
- Learn new issues or information, the subject may disclose!

31.3.4 Equipment

In addition to recording equipment the lie detection process uses the following gadgets:

1. **Pneumograph:** it is a corrugated rubber tube. It is tied around the subject's chest. It measures respiratory changes.
2. **Sphygmograph:** it is an inflated cuff. It is wrapped around the upper arm. It measures the cardiovascular changes.
3. **Electrode:** it is attached to the palm or fingers. It measures the Galvanic (electrodermal) Skin Response (GSR).
4. **Plethysmograph: i**t is a transducer. It is attached to the thumb. It measures blood volume reflecting the pulse rate.

All the measurements through the above instruments are recorded simultaneously in the form of traces on a graph paper individually. These graph recordings, are collectively called a Polygram. It is evaluated to find out whether during the test the subject experienced emotional stress from any of the questions asked, or showed no reaction.

31.3.5 Techniques

In questioning the subject, generally the following basic approaches are followed:

31.3.5.1 Relevant/Irrelevant Question Technique (RIQ)

In this technique, both relevant and irrelevant questions, pertaining to the case in hand, are asked. The irrelevant questions to the case under investigation are like:

- 'Is your name Mr. X?' Or,
- 'Did you take tea in the morning?'

The irrelevant questions are interspersed with relevant questions that are related to the crime, such as:

- 'Did you steal the jewellery?' Or,
- 'Did you shoot the victim with a revolver?'

The difference in the physiological response to relevant and irrelevant questions indicates whether the person is telling the truth or is lying.

31.3.5.2 Peak of Tension Technique (POT)

In the Peak of Tension technique, only one pertinent but emotionally charged question, after several control questions, of irrelevant nature, is asked. The irrelevant questions build the tension, which is released after the relevant question has been asked. The technique is

dependent for its usefulness on the fact that a guilty person may possess knowledge that no innocent person could possess. A question regarding this knowledge would produce emotional reactions in a guilty person, while an innocent person would show no reaction to the question.

31.3.5.3 Controlled Question Technique (CQT or RCQT)

In controlled question technique, controlled questions are asked. These questions relate to the associative evidence already known to the examiner. Only the culprit can show a reaction to the questions, as he alone knows them. The questions are inter-mixed with irrelevant questions. The reaction is recorded in the Polygram like the other techniques. The technique is also called after the name of its first user Reid, RCQT, R for Reid.

31.3.5.4 Miscellaneous Techniques

There are many other techniques, similar to the above techniques with some variations in the details; including the following:

- *Multiple General Question Technique MGQT*
- *Guilty Knowledge Test (GKT)*
- *Silent Answer Technique (SAT).*
- *Asking questions to which the subject must lie.*

The details of these are unnecessary for the non-practitioner; hence beyond the scope of this book

31.3.6 Interpretation

The difficult aspect of a lie-detection test, however, is the interpretation of the Polygram. In analysing, evaluating and interpreting a Polygram, the following aspects are carefully considered.

- Simultaneous occurrence of suppression in respiration and increase in blood pressure immediately before the subject's reply
- Decrease in blood pressure several seconds after the reply
- Heavier breathing, 15-20 seconds after the reply, to a relevant question
- Slowing down of subject's pulse beat after the questioning is over and the subject is told that no more questions would be asked of him.
- A general upward trend of the entire blood pressure curve during the test is indicative of tension due to feeling of guilt.
- Interpretation of GSR is based on certain upward movement of the tracings due to changes in the electrical resistance of the skin of the subject.
- Regarding GSR it may, however, be noted that the exact nature of these responses is not yet completely understood. The authorities differ considerably in their opinion. It is rather surprising that although in the experimental deception tests conducted in the laboratory, GSR offers reliable deceptive criteria, in actual field cases similar high degree of accuracy is not often available as in other measurements of physiological responses, such as, blood pressure and pulse.
- Each questionnaire is run three times.

The aspects, which are considered for evaluation and interpretation of the Polygram, will become clear from the illustration given below:

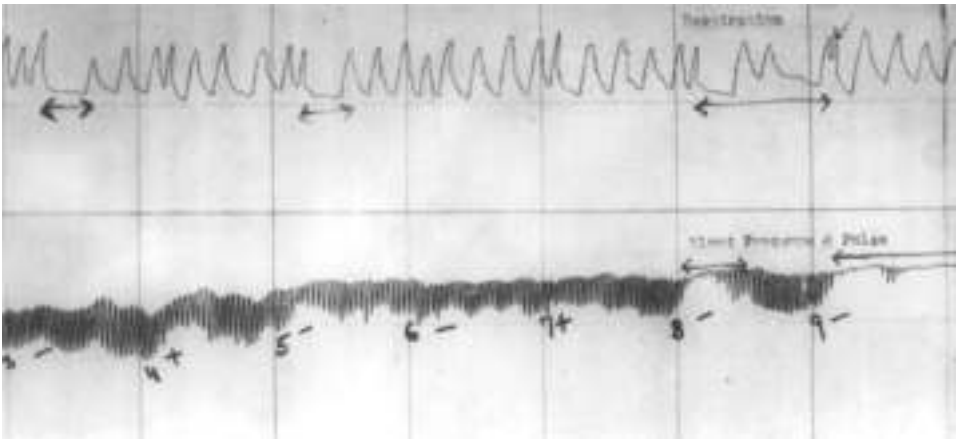


Fig. 31.1

Polygram Showing Respiratory and Cardio-vascular Responses of a Deceptive Subject. Note the Difference in the Response of Relevant Question Nos. 3, 5, 8 and 9 to Irrelevant Question Nos. 4 and 7. Question No. 6 was a Control Question for Toning up the Subject Emotionally.

In a murder case the suspect denied that he had seen the victim after sunset. He also denied the charges that either he committed the murder or knows who committed the offence. In this case, RIQ (relevant/irrelevant question technique) was followed.

1. *'Did you take tea in the morning?'*
2. *'Can you read Hindi newspaper?'*

To arouse the suspect emotionally a control question (S. No. 6) was asked:

6. 'Can you murder someone?'

Questions at S. Nos. 3, 5, 8 and 9 were relevant. They were, respectively:

3. *'Did you see X (victim) after sunset?'*
5. *'Do you have any information as to where did X go after sunset?'*
8. *'Did you murder X?', and lastly,*
9. *'Do you have any knowledge as to who murdered X?'*

The plus (+) and minus (–) signs on the Polygram are indicative of the suspect's reply in affirmative or negative, respectively. The changes in the tracings of respiration, blood pressure and pulse at relevant questions in comparison to irrelevant questions are indicative of deception. Particularly, the suspect's physiological reactions to questions at S. No. 8 and 9 indicate that he was directly involved in the crime which he later admitted to the police when confronted with the test results. (CH)

31.4 LEGAL MUDDLE

There is confusion all round about the legal status of the evidence pertaining to Lie Detection (Truth Verification) techniques. A 2010 judgment of the Supreme Court[2] has restricted the

2. *Mst. Selvi v State of Karnataka*, AIR 2010 SC 1974 : 2010 AIR SCW 3011 : (2010) 7 SCC 263.

legal status of the important tools, which have and tend to replace the III Degree methods. The main direction in the judgment is that the tests (Lie Detection, Narco-analysis, Brain Electrical Activated Oscillation, etc.) can be administered only if the subject gives informed consent for the test. This informed consent, largely, was being taken before the test was administered. This simple direction has been enshrouded in so many words (>250 pages!).

Polygraph interrogation is riddled with many legal controversies. The main legal issues, which are discussed in Indian courts, are:

1. Supreme Court Judgment (Supra) on polygraph and other types of psychological interrogation
2. Does (or does not) polygraph interrogation infringe article 20(3) of the Constitution?
3. Do polygraph interrogations tantamount to III Degree treatment of the subject?
4. Does polygraph interrogation fall in the ambit of Evidence Act?
5. Are the rights of the criminal or are the rights of the public at large, paramount?
6. Is polygraph interrogation an invasion on the privacy of the subject?

These issues have to be appraised dispassionately if polygraph interrogation has to be accepted or rejected as a tool of investigation or a potent source of evidence in courts.

31.4.1 Supreme Court on Polygraph

In 2010, a Bench of Supreme Court of India headed by the then Chief Justice of India (who wrote the judgment) has given verdict upon Polygraph and other emerging new branches of Forensic Psychology (supra). The salient features of the judgment, *vis-à-vis* polygraph interrogation are:

1. The polygraph interrogation to be administered only with the consent of the subject before a magistrate.
2. Nobody to be forced to undergo the test involuntarily.
3. The material and other evidence derived from the polygraph interrogation can be used as evidence under section 27 of the Indian Evidence Act.
4. Direct evidence from polygraph interrogation is inadmissible unless supported by other evidence.
5. Involuntary interrogation amounts to III degree methods and the court cannot permit such tests.
6. The compelling public interest cannot justify ignoring right against self-incrimination.
7. Parliament may consider enacting laws to make the involuntary test admissible in compelling public interest cases.

The only setback to the police is that involuntary polygraph interrogation is not allowed. It is unfortunate that in serious crimes where it is needed most to interrogate hardened criminals who would not consent to take the test, the police is deprived of the scientific facility.

It is equally unfortunate that the government failed to put up facts before the court completely and lucidly to show that even involuntary polygraph interrogation is not unconstitutional for the following reasons:

1. Polygraphist just unravels the memory of the subject relating to the incident which is hidden in the fold of the brain. The information so extracted may explicate (or implicate) the subject. The psychologist does not know its value nor does he care for

the same. He just records it through audio and video films. It becomes an evidence only when the investigator evaluates it *vis-à-vis* the circumstances of the case. The contents may be explicatory or implicatory.

In the infamous Nithari serial *murders, polygraph interrogation exonerated, in some cases, Pandher for murder charges where 16 girls were murdered in his own house! (CH)*

The blood from a suspect is drawn with a syringe needle day in and day out for identifying murderers, rapists and other sex criminals, for determining disputed paternity, rape, murder and for other serious or petty crimes. Such blood drawl is not considered unconstitutional in India. Rather courts have ordered drawl of blood in many a case.

N.D. Tewari's (a renowned politician!) was involved in a Disputed Paternity case. He refused to give blood for DNA analysis. Delhi High Court ordered to take the blood forcibly in case he does not give blood as such. He gave the blood. (CH)

In polygraph interrogation, no blood is drawn. Only blood pressure measuring rubber cuffs (like those in therapy) are used and only for a few minutes. These attachments cannot be equated to III Degree torture where the subject is beaten severely and shown many indignities. We cannot have two standards in the dissemination of justice. If use of needle is legal in one type, can it be unconstitutional in other types of cases. Recent developments in technology have improved such devices that the subject hardly feels the presence of those attachments.

2. It is unfortunate that it was not brought to the notice of the court that polygraph interrogation does not cause any pain to the subject and that the prosecution failed to produce expert to explain the process to the court. By no stretch of imagination, who knows the nature of the test, can equate polygraph interrogation with III Degree methods.

3. The Supreme Court in an earlier judgment[3] has clarified that:

   Article 20(3) "**does not say that an accused person cannot be compelled to be a witness".** It says that such a person **"cannot be compelled to be witness against himself".**

   The question, therefore, is whether the accused is "furnishing evidence" against him, in the lie detection. If we consider the extraction of evidence from memory layers by scientific methods then where is the question of the subject furnishing the evidence against himself? He is not furnishing any evidence. It is being taken into possession like other evidence (fingerprints or footprints from an unwilling accused). Taking of fingerprints or footprints or photographs does not attract infringement of article 20(3). On parity, Polygraph interrogation also does not infringe the Article 20(3) of the Constitution.

It is unfortunate that the scientific facts and parity of the evidence with other evidence were not brought to the notice of the court to prevent injustice to polygraph interrogation and other Forensic Psychological techniques.

31.4.2 Polygraph and Article 20(3) of Constitution

Article 20(3) states:

"No person, accused of an offence, can be compelled to be a witness against himself".

The relevant contents of the above have two elements: *firstly,* **'no person accused of an offence can be compelled'** and *secondly*, **'to be a witness against himself'.** It is true that most of the persons put to polygraph interrogation are accused of an offence(s). But neither are they compelled nor they become witness against themselves.

3. *State of Bombay v Kathi Kalu Oghad*, AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).

No one is compelled to give evidence against him. In fact, the consent of the subject is taken before he is subjected to narco-analysis interrogation. In a recent case[4] the Gujarat Laboratory refused to carry out narco-analysis interrogation because the accused refused to give consent for the test. Thus, there is no compulsion to undergo the test. Further, the accused persons are often ready to undergo the test to get themselves explicated of the accusation.

> *In Nithari serial murders there were two accused; Surrender Koli and Mohinder Singh Pandher. Both opted for polygraph interrogation. The test explicated the latter of murdering acts of some of the sixteen girls. (CH)*

The subject undergoing polygraph interrogation is not a witness against himself. In fact, information is being extracted from him like other evidence: blood for DNA analysis, fingerprints and footprints for comparison, etc. The law has allowed the collection of the latter types of evidence even forcibly, against subject's will.

Further, the information is not evidence until it is evaluated. The evaluation may even exonerate the subject of the charge as has happened to Mohinder Singh Panther in some of the recent notorious Nithari serial killing cases.

In polygraph interrogation, the accused (subject) does not become a witness against himself. In fact, he gives wrong answers, which do not implicate him. He does not give the information. The information is extracted by scientific methods by scientists following standard procedures. The evidence obtained is just like the evidence extracted from the accused in murder, rape or other cases in which the culprit leaves blood, flesh, skin, saliva, etc. at the crime scene or with the victim. Information of the source is obtained only when blood is extracted from the accused, analysed and matched with the corresponding data from the incriminating evidence. Both the enacted and case law has allowed the practice. In some cases, even courts have ordered the extraction of blood.[5]

Extraction of evidence through polygraph interrogation by qualified scientists under proper conditions has to be treated at par with the blood extraction of blood evidence if we want to avoid the charge of ignorance, bigotry and judicial chauvinism.

The utility and acceptance, by the courts, of the evidence has to depend upon the quality of evidence, its proper processing and presentation.

In short, polygraph interrogation does not infringe sub-article 20(3) of the Indian Constitution.

31.4.3 Polygraph a New Avatar of III Degree Methods

Polygraph interrogation is no new Avatar of III Degree methods. In fact, as already seen, it gives relief to the subject from III Degree treatment: from pain and indignities. Those who call polygraph interrogation as a new type of III Degree mode are perhaps unaware that modern polygraph interrogation does not inflict any pain; instead, it eliminates pain indignities and even custodial deaths. Consequently, it is blasphemy to equate it with III Degree modes.

31.4.4 Public Rights Paramount

One can understand that no innocent person should be convicted but do our Constitution or lawmakers intend that the criminal be let loose on public on flimsy grounds? Whose interests are the government, the legislature and the judiciary watching and protecting? Are they worried about the public of teaming millions or of a handful of criminals? There can be no two opinions or answers to this question. The rights of the public are paramount.

4. State FSL Gandhinagar Rao case.
5. In *N.D. Tewari's* disputed paternity case, on refusal to give blood, Delhi High Court ordered the accused to furnish blood.

Science has made tremendous progress in recent years. The criminal is using science to the hilt to carry out his nefarious activities. The law keepers are hindered from using modern science: flimsy law points, corruption, avoidable administrative delay, low priority to modernize scientific investigations, etc. Consequence: the criminal gets away with the crime; which emboldens not only him but also others with criminal tendencies. Most of the criminals in heinous crime are acquitted, because:

1. Wrong notions of law and justice
2. Topsy-turvy priorities of the government and of various wings of criminal justice system
   - The government does not create adequate police manpower and scientific facilities including scientific manpower.
   - The police dance attendance upon VIPs instead of making the criminal do the dancing around them.
3. Prosecutors give free hand to the defence lawyers (and courts) for many reasons.
4. The judges are bound to old order. Some years ago a trial judge remarked, "Let me explode the myth of scientific evidence once forever," Others go on prolonging cases for years, again, for no valid reasons.

The sorry state of affairs continues.

The public interest must be made paramount. If the privacy of the culprit, who has shattered the home life of the victim, suffers; nothing is lost. Likewise, if the culprit has to suffer some inconvenience, no harm is done. The subject has to bear such burdens if the public interest, at large, has to be paramount.

31.4.5 Subject's Rights

The critics of polygraph technique emphasise that the technique involves an intrusion into the privacy of the subject. In order to counter such criticism, certain rights of the subject have been formulated. These rights are respected. These are:

- Only a qualified examiner is to examine the subject.
- The subject must be declared fit for polygraph examination.
- He must be informed of the reasons for the polygraph test.
- He should know how the polygraph functions and data is obtained.
- He must consent to take the polygraph test. He can refuse to submit to polygraph test.
- He must not be exposed to mental and physical abuse.
- He must not be subjected to prolonged questioning.

31.4.6 National

The Human Right Commission has issued the following guidelines for the Lie Detection test

(i) No Lie Detector Tests should be administered except on the basis of consent of the accused. An option should be given to the accused whether he wishes to avail such test.

(ii) If the accused volunteers for a Lie Detector Test, he explained should be given access to a lawyer and the physical, emotional and legal implications of such a test should be to him by the police and his lawyer.

(iii) The consent should be recorded before a Judicial Magistrate.

(iv) During the hearing before the Magistrate, the person alleged to have agreed should be duly represented by a lawyer.

(v) At the hearing, the person in question should also be told in clear terms that the statement that is made shall not be a 'confessional' statement to the Magistrate but will have the status of a statement made to the police.

(vi) The Magistrate shall consider all factors relating to the detention including the length of detention and the nature of the interrogation.

(vii) The actual recording of the Lie Detector Test shall be done by an independent agency (such as a hospital) and conducted in the presence of a lawyer.

(viii) A full medical and factual narration of the manner of the information received must be taken on record.

31.5 APPLICATION AND UTILITY

Since the development of polygraph, it has been widely applied in a criminal investigation by the police, especially in the USA and Japan. However, of late, the polygraph has also been used for other purposes:

- Recruitment of police and other personnel.
- Department of defence, banks and other organisations use lie detector as an aid for the investigation undertaken by them.
- The big business and industrial concerns in the USA use the lie detector for checking the honesty of their employees.

Specific utility of polygraph

1. It is time and cost effective method of interrogation.
2. It can expose deception in many situations like malingering.
3. The techniques are humane – they dispense with III Degree methods.
4. Innocent persons escape police harassment as it discriminates between the innocent and the guilty.
5. The test often induces guilty to confess to his crime.
6. It can identify the culprit and his accomplices.
7. It can help locate the *corpus delicti*/hidden evidence/booty .
8. It can check the veracity of the statement of a witness.
9. It can identify the insider fraudster in bank frauds.

31.6 LIMITATIONS

One of the main difficulties in conducting a lie detection test is the nervousness shown by many truthful or innocent subjects under interrogations. The nervousness may be due to fear of being involved in a crime, which he has not committed or due to guilt complex from some other offence committed earlier. Such nervousness is manifested in the polygraph chart by the general erratic character of the tracings (mainly of blood pressure). In such tracings, usually similar type of physiological responses can be observed to both relevant and irrelevant questions (Fig. 28.3).

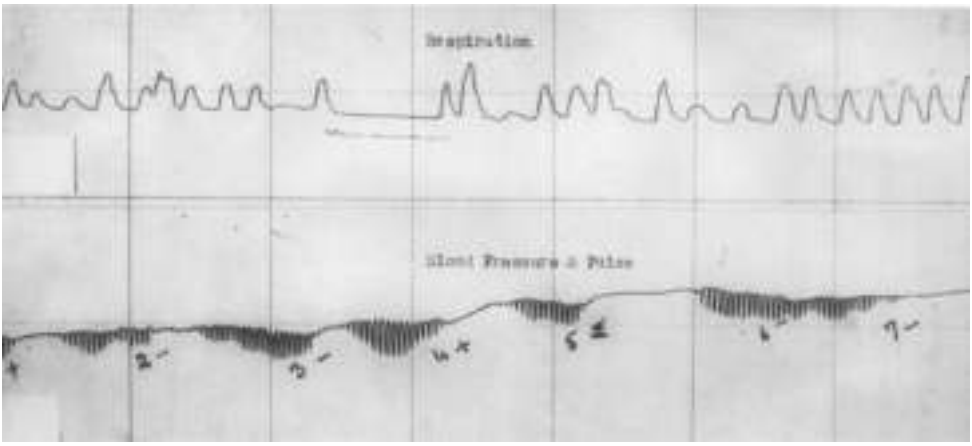


Fig. 31.2

Polygram Showing Respiratory and Cardio-vascular Responses of a Nervous but Truthful Subject. The Subject Reacted Equally to all the Questions Relevant (3 and 5) or Irrelevant (1, 2, 4 & 7). The Control Question at No. 6 Could not Arouse the Subject Emotionally.

A biased attitude of the examiner can affect the diagnosis. If the examiner believes that the suspect is guilty he is prone to find evidence of his guilt on the polygraph chart. Similarly, if he believes that the subject is innocent, he is prone to find evidence of innocence. This is especially true with newcomers in the profession furnish reports without peer participation in the examination.

Other sources of error are the unresponsiveness of the subject; some unobserved muscle movements, physical or mental illness. The examiner must strictly follow the essential conditions for the successful operation of a polygraph. Novice examiners can mess the whole process.

31.7 CRITICISM AND REBUTTAL

The lie detector and other psychological deception tests have proved their worth as a unique aid to investigation. However, in detection of deception interpretation of the Polygram has been under fire for its reliability and validity by the judiciary, labour unions and occasionally by the public as well. The basis of such criticism is the element of subjectivity in the interpretation of Polygram. This apart, the measurements of the physiological changes upon which the detection of deception tests are based still have not gained sufficient scientific recognition from physiologists and psychologists. Other adverse views are that the polygraph is:

- Not sufficiently accurate,
- Not reliable,
- Misused, and
- Humiliating and degrading for the person taking the test.

To rebut such criticism, the experts observe that a qualified and experienced polygraph examiner, by taking into account the specific deception criteria, can easily eliminate the subjective element from the interpretations.

The claims of the experts have been demonstrated experimentally where the objectives were to determine whether or not the professional polygraph examiners, working independently of each other, are able to detect deception successfully from the analysis of polygraphs only.

The examiners were given polygraph charts pertaining to actual field cases only. No other factual data with regard to the polygraph charts such as history of the case, test questions, subject's behaviour, etc. were supplied to the examiners. In three experiments, accuracy in judgment was reported as 75%, 87.8% and 86% respectively. If the examiners had access to the background information of the case, test questions and behaviour of the subject, the accuracy percentage would have been even higher. (CH)

Another objection against the use of polygraph is that inflated blood pressure cuff is inconvenient, painful and a psychological torture. The objection, however, is not legitimate. *Firstly*, the duration of the lie-detection test is very short, approximately 4 to 5 minutes, during which the inflated cuff certainly would cause no extensive physical pain. *Secondly*, if a slight discomfort for a few minutes can yield success in garnering the truth, the effort and method is far better than the prolonged interrogation the subject may otherwise have to bear. Lastly, the psychological feeling of torture is eliminated during the pre-interrogation interview with the subject. The inconvenience due to the cuff can be explained to him at that time. Further, the cuff has since been modified. It is no longer painful.

All said and done, the lie-detector is, for the detection of deception, an effective and valuable weapon, indispensable aid in the investigation of crime.

31.8 LEGAL STATUS

Largely, lie-detector evidence has limited judicial recognition. In a few courts of USA, polygraph test results have been recognised for their value as an aid to investigation and in some cases, the expert evidence relating to polygraph has been accepted. The experts in areas like fingerprints; firearms identification questioned documents have been widely acclaimed. But the polygraph experts have not received acceptance and recognition from the court. It is unfortunate when the polygraphists have established 95 to 98% accuracy of the lie-detector in detecting deception or the truthfulness of the subjects in criminal investigations. Based on relevant scientific data on the lie detector, it is strongly felt the courts should accept deception test results because it can furnish an effective method and technique for the exposure of deception in a subject. Since polygraph interrogation is the best available method to detect deception, the time has come for the courts to admit polygraph evidence.

The Chicago Bar Association Committee of Criminal Law undertook a study on the polygraph and its role in the administration of criminal justice. The committee concluded as follows:

- Polygraph has a place in the detection of crime because of the psychological effect on persons, who are in fact guilty of the crime.
- There may be 5–30 % errors in the test results, depending upon the ability of the examiner and other factors.
- Unqualified operators could cause unnecessary injury to innocent persons.
- Refusal to take a polygraph test should have no bearing on the presumption of innocence.
- The polygraph is not a substitute for the competent detection and investigation of crime.
- Due to the fallibility of the results of the polygraph examination, it should not be admitted as evidence in court cases.

The present position regarding the acceptability of lie detection test results is that in some of the courts of the USA it has been accepted as legal evidence. There are instances where the courts have recognised and utilised the polygraph test to base decisions. In USA, out of 23 States, 11 have enacted legislation to create a licensing authority for polygraphists to conduct

a certain specific type of polygraph examination, like cases of disputed paternity. In remaining 12 States, no such legislation has yet been enacted. The only other countries where polygraph has been put to extensive use in the criminal justice system are Japan and Israel. The legal status here is no different from that in the USA. In Japan, some of the courts have accepted the polygraph test results.

The use of lie detector in Canada or European countries, e.g., the U.K., France, and Germany and so on, is not extensive. Nevertheless, it is on the increase.

In India, Central Forensic Science Laboratory, Central Bureau of Investigation, New Delhi, was the first laboratory to create Lie Detection Division in 1972. The laboratory has examined more than nine thousand subjects. In fact, they are not able to provide examination facilities to those who requisition the same. Some other laboratories have also come up in other states including Gujarat, Maharashtra, Madhya Pradesh, and Karnataka. which are now providing the facility of polygraph for crime investigation purposes. A number of other institutions are also introducing the facility.

The polygraph test results do not appear to have been utilised in the courts extensively. However, there is no law, which forbids the use of lie detector in criminal investigations. In fact section 45 of the Indian Evidence Act is wide enough to accept the polygraph evidence. Supreme Court has allowed the uses of polygraph in police investigation *vide* their 2010 judgment in *Mst. Selvi v State of Karnataka*[6] though it has prohibited its use as evidence in the courts. They have placed a rider that the subject must give his informed consent before a magistrate prior to administration of the test. The same judgment has given the same rulings relating to other Forensic psychology branches like narco-analysis and brain profiling. In fact, consent of the subject was being taken even before the judgment.

The lie detectors are in fact providing useful assistance in criminal investigations in thousands of cases.

31.9 RECENT ADVANCES

The main innovation in the traditional polygraph has been the induction of computer to record and analyse the physiological responses and data, though some innovations in the input devices to increase the number of recording, to decrease the discomfort and to reduce the time for the examination have also come up.

Kircher and Yanka did the pioneer work to produce computer assisted polygraph system. They also developed the algorithm for fieldwork. Now instruments have come up with software, which sample, process and evaluate the data automatically with the help of the algorithm, for diagnostic purposes.

Computerised polygraph test has the following advantages:

1. Operational training need less time
2. It provides better interpretable data.
3. It does not need frequent calibrations; as in traditional polygraphs.
4. Data can be stored and printed.
5. Physiological signals analog can be digitized and algorithm can be developed.

6. *Mst. Selvi v State of Karnataka,* AIR 2010 SC 1974 : 2010 AIR SCW 3011 : (2010) 7 SCC 263.

31.9.1 New Input Devices

Electroencephalograph is a new device as far as PDD is concerned. It records the cognitive processes. It utilises the Event Related Brain Potential (ERP). For example, if the weapon of offence is shown to the subject and if he happens to be the culprit, he will recognise the weapon and EEG trace will show change in the wave pattern. The mode of recording and identifying the culprit's ERP is called brain Printing or Brain Fingerprinting on the pattern of DNA fingerprinting. Additional research is needed to make the technique more useful, in spite of the claims of 100% accuracy by some of its protagonist.

31.9.2 Non-Invasive Sensors/Transducers

The important non-invasive cardiovascular device is Finapres, which replaces blood pressure cuffs. Finapres is a transducer, applied to a finger, which responds to blood volume changes, which are recorded by the computer to give systolic and diastolic pressures and heart beat rate.

Likewise, voice response of answers "yes" or "no" to question put to subject is also being examined through voice spectrum analysis software. This examination is different from the analysis through Psychological Stress Elevator (PSE), which analyse subsonic laryngeal micro tremors for stress.

The main thrust is to develop additional software to analyse the PDD data. It is hoped that better software will improve the PDD data evaluation in the coming times.

An instrument utilising the neurosciences named ARIS (Automatic Response Indicator System) has also come up. It utilises homeostatic communication of the brain with the outer brain parts. It is believed that the Central Nervous System (CNS) controls the working of the outer parts. The control is disturbed by deception. The instrument (patented) measures the disturbance. ARIS algorithm consists of blood pressure, respiration, electro-dermal response, movement and EEG.

31.10 ADDITIONAL READINGS

1. Reid, JE and Inbau, FE, *Truth and Deception,* The Polygraph Technique, William and Wilking, Baltemore.
2. Matte, JA, *The Art and Science of Polygraph Technique,* Charles C. Thomas, USA.

31.11 CASE LAW

31.11.1 Evidence Inadmissible[7]

1. The legal questions in this batch of criminal appeals relate to the involuntary administration of certain scientific techniques, namely **narcoanalysis, polygraph examination and the Brain Electrical Activation Profile (BEAP) tes**t for the purpose of improving investigation efforts in criminal cases.

This issue has received considerable attention since it involves tensions between the desirability of efficient investigation and the preservation of individual liberties. Ordinarily the judicial task is that of evaluating the rival contentions in order to arrive at a sound conclusion. However, the present case is not an ordinary dispute between private parties. It raises pertinent questions about the meaning and scope of fundamental rights which are available to all

7. *Mst. Selvi v State of Karnataka,* AIR 2010 SC 1974 : 2010 AIR SCW 3011 : (2010) 7 SCC 263.

citizens. Therefore, we must examine the implications of permitting the use of the impugned techniques in a variety of settings.

2. Objections have been raised in respect of instances where individuals who are the accused, suspects or witnesses in an investigation have been subjected to these tests without their consent. Such measures have been defended by citing the importance of extracting information which could help the investigating agencies to prevent criminal activities in the future as well as in circumstances where it is difficult to gather evidence through ordinary means. In some of the impugned judgments, reliance has been placed on certain provisions of the Code of Criminal Procedure, 1973 and the Indian Evidence Act, 1872 to refer back to the responsibilities placed on citizens to fully co-operate with investigation agencies. It has also been urged that administering these *techniques* does not cause any bodily harm and that the extracted information will be used only for strengthening investigation efforts and will not be admitted as evidence during the trial stage. The assertion is that improvements in fact-finding during the investigation stage will consequently help to increase the rate of prosecution as well as the rate of acquittal. Yet another line of reasoning is that these scientific techniques are a softer alternative to the regrettable and allegedly widespread use of 'third degree methods' by investigators.

3. The involuntary administration of the impugned techniques prompts questions about the protective scope of the 'right against self-incrimination' which finds place in Article 20(3) of our Constitution. In one of the impugned judgments, it has been held that the information extracted through methods such as 'polygraph examination' and the 'Brain Electrical Activation Profile (BEAP) test' cannot be equated with 'testimonial compulsion' because the test subject is not required to give verbal answers, thereby falling outside the protective scope of Article 20(3). It was further ruled that the verbal revelations made during a narcoanalysis test do not attract the bar of article 20(3) since the inculpatory or exculpatory nature of these revelations is not known at the time of conducting the test. To address these questions among others, it is necessary to inquire into the historical origins and rationale behind the 'right against self-incrimination'. The principal questions are whether this right extends to the investigation stage and whether the test results are of a 'testimonial' character, thereby attracting the protection of article 20(3). Furthermore, we must examine whether relying on the test results or materials discovered with the help of the same creates a reasonable likelihood of incrimination for the test subject.

4. We must also deal with arguments invoking the guarantee of 'substantive due process' which is part and parcel of the idea of 'personal liberty' protected by article 21 of the Constitution. The first question in this regard is whether the provisions in the Code of Criminal Procedure, 1973 that provide for 'medical examination' during the course of an investigation can be read expansively to include the impugned techniques, even though the latter is not explicitly enumerated. To answer this question, it will be necessary to discuss the principles governing the interpretation of statutes in light of scientific advancements. Questions have also been raised with respect to the professional ethics of medical personnel involved in the administration of these techniques. Furthermore, article 21 has been judicially expanded to include a 'right against cruel, inhuman or degrading treatment', which requires us to determine whether the involuntary administration of the impugned techniques violates this right whose scope corresponds with evolving international human rights norms. We must also consider contentions that have invoked the test subject's 'right to privacy', both in a physical and mental sense.

5. The scientific validity of the impugned techniques has been questioned and it is argued that their results are not entirely reliable. For instance, the narcoanalysis technique involves the intravenous administration of sodium pentothal, a drug which lowers inhibitions on part of the subject and induces the person to talk freely. However, empirical studies suggest

that drug-induced revelations need not necessarily be true. Polygraph examination and the BEAP test are methods which serve the respective purposes of lie-detection and gauging the subject's familiarity with information related to the crime. These techniques are essentially confirmatory in nature, wherein inferences are drawn from the physiological responses of the subject. However, the reliability of these methods has been repeatedly questioned in empirical studies. In the context of criminal cases, the reliability of scientific evidence bears a causal link with several dimensions of the right to a fair trial such as the requisite standard of proving guilt beyond reasonable doubt and the right of the accused to present a defence. We must be mindful of the fact that these requirements have long been recognised as components of 'personal liberty' under article 21 of the Constitution. Hence, it will be instructive to gather some insights about the admissibility of scientific evidence.

9. The origins of polygraph examination have been traced back to the efforts of Lombroso, a criminologist who experimented with a machine that measured blood pressure and pulse to assess the honesty of persons suspected of criminal conduct. His device was called a hydrosphygmograph. A similar device was used by psychologist William Marston during World War I in espionage cases, which proved to be a precursor to its use in the criminal justice system. In 1921, John Larson incorporated the measurement of respiration rate and by 1939 Leonard Keeler added skin conductance and an amplifier to the parameters examined by a polygraph machine.

10. The theory behind polygraph tests is that when a subject is lying in response to a question, he/she will produce physiological responses that are different from those that arise in the normal course. During the polygraph examination, several instruments are attached to the subject for measuring and recording the physiological responses. The examiner then reads these results, analyzes them and proceeds to gauge the credibility of the subject's answers. Instruments such as cardiographs, pneumographs, cardio-cuffs and sensitive electrodes are used in the course of polygraph examinations. They measure changes in aspects such as respiration, blood pressure, blood flow, pulse and galvanic skin resistance. The truthfulness or falsity on part of the subject is assessed by relying on the records of the physiological responses.[8]

11. There are three prominent polygraph examination techniques:

(i) The relevant-irrelevant (R-I) technique

(ii) The control question (CQ) technique

(iii) Directed Lie-Control (DLC) technique.

Each of these techniques includes a pre-test interview during which the subject is acquainted with the test procedure and the examiner gathers the information which is needed to finalize the questions that are to be asked. An important objective of this exercise is to mitigate the possibility of a feeling of surprise on part of the subject which could be triggered by unexpected questions. This is significant because an expression of surprise could be mistaken for physiological responses that are similar to those associated with deception. [Refer: David Gallai, '*Polygraph evidence in federal courts: Should it be admissible?*' 36 American Criminal Law Review 87-116 (Winter 1999) at p 91]. Needless to say, the polygraph examiner should be familiar with the details of the ongoing investigation. To meet this end the investigators are required to share copies of documents such as the First Information Report (FIR), Medico-Legal Reports (MLR) and Post-Mortem Reports (PMR) depending on the nature of the facts being investigated.

8. "Laboratory Procedure Manual: Polygraph Examination," Directorate of Forensic Science, Ministry of Home Affairs, Government of India, New Delhi, 2005.

12. The control-question (CQ) technique is the most commonly used one and its procedure as well as scoring system has been described in the materials submitted on behalf of CBI. The test consists of control questions and relevant questions. The control questions are irrelevant to the facts being investigated but they are intended to provoke distinct physiological responses, as well as false denials. These responses are compared with the responses triggered by the relevant questions. Theoretically, a truthful subject will show greater physiological responses to the control questions which he/she has reluctantly answered falsely, than to the relevant questions, which the subject can easily answer truthfully. Conversely, a deceptive subject will show greater physiological responses while giving false answers to relevant questions in comparison to the responses triggered by false answers to control questions. In other words, a guilty subject is more likely to be concerned with lying about the relevant facts as opposed to lying about other facts in general. An innocent subject will have no trouble in truthfully answering the relevant questions but will have trouble in giving false answers to control questions. The scoring of the tests is done by assigning a numerical value, positive or negative, to each response given by the subject. After accounting for all the numbers, the result is compared to a standard numerical value to indicate the overall level of deception. The net conclusion may indicate truth, deception or uncertainty.

13. The use of polygraph examinations in the criminal justice system has been contentious. In this case, we are mainly considered with situations when investigators seek reliance on these tests to detect deception or to verify the truth of previous testimonies. Furthermore, litigation related to polygraph tests has also involved situations where suspects and defendants in criminal cases have sought reliance on them to demonstrate their innocence. It is also conceivable that witnesses can be compelled to undergo polygraph tests in order to test the credibility of their testimonies or to question their mental capacity or to even attack their character.

14. Another controversial use of polygraph tests has been on victims of sexual offences for testing the veracity of their allegations. While several states in the USA have enacted provisions to prohibit such use, the text of the *Laboratory Procedure Manual for Polygraph Examination* [supra.] indicates that this is an acceptable use. In this regard, para 3.4(v) of the said Manual reads as follows:

> *(v) In cases of alleged sex offences such as intercourse with a female child, forcible rape, indecent liberties or perversion, it is important that the victim, as well as the accused, be made available for interview and polygraph examination. It is essential that the polygraph examiner get a first-hand detailed statement from the victim, and the interview of the victim precedes that of the suspect or witnesses. ...*

[The following article includes a table which lists out the statutorily permissible uses of polygraph examination in the different state jurisdictions of the United States of America.[9]

> *15. The propriety of compelling the victims of sexual offences to undergo a polygraph examination certainly merits consideration in the present case. It must also be noted that in some jurisdictions polygraph tests have been permitted for the purpose of screening public employees, both at the stage of the recruitment and at regular intervals during the service-period. In the USA, the widespread acceptance of polygraph tests for checking the antecedents and monitoring the conduct of public employees has encouraged private employers to resort to the same. In fact the Employee Polygraph Protection Act, 1998 was designed to restrict their use for employee screening. This development must be noted because the unqualified acceptance of 'Lie-detector tests' in India's criminal justice system could have the unintended consequence of encouraging their use by private parties.*

16. Polygraph tests have several limitations and therefore a margin for errors. The premise behind these tests is questionable because the measured changes in physiological responses are not necessarily triggered by lying or deception. Instead, they could be triggered by nervousness,

9. Henry T. Greely and Judy Illes, "Neuroscience based lie-detection: The urgent need for regulation," 33 American Journal of Law and Medicine, 2007, pp 377–421.

anxiety, fear, confusion or other emotions. Furthermore, the physical conditions in the polygraph examination room can also create distortions in the recorded responses. The test is best administered in comfortable surroundings where there are no potential distractions for the subject and complete privacy is maintained. The mental state of the subject is also vital since a person in a state of depression or hyperactivity is likely to offer highly disparate physiological responses which could mislead the examiner. In some cases the subject may have suffered from loss of memory in the intervening time-period between the relevant act and the conduct of the test. When the subject does not remember the facts in question, there will be no self-awareness of truth or deception and hence the recording of the physiological responses will not be helpful. Errors may also result from 'memory-hardening', *i.e.*, a process by which the subject has created and consolidated false memories about a particular incident. This commonly occurs in respect of recollections of traumatic events and the subject may not be aware of the fact that he/she is lying.

17. The errors associated with polygraph tests are broadly grouped into two categories, *i.e.*, 'false positives' and 'false negatives'. A 'false positive' occurs when the results indicate that a person has been deceitful even though he/she answered truthfully. Conversely, a 'false negative' occurs when a set of deceptive responses is reported as truthful. On account of such inherent complexities, the qualifications and competence of the polygraph examiner are of the utmost importance. The examiner needs to be thorough in preparing the questionnaire and must also have the expertise to account for extraneous conditions that could lead to erroneous inferences.

18. However, the biggest concern about polygraph tests is that an examiner may not be able to recognise deliberate attempts on part of the subject to manipulate the test results. Such 'countermeasures' are techniques which are deliberately used by the subject to create certain physiological responses in order to deceive the examiner. The intention is that by deliberately enhancing one's reaction to the control questions, the examiner will incorrectly score the test in favour of truthfulness rather than deception. The most commonly used 'countermeasures' are those of creating a false sense of mental anxiety and stress at the time of the interview, so that the responses triggered by lying cannot be readily distinguished.

19. Since polygraph tests have come to be widely relied upon for employee screening in the USA, the US Department of Energy had requested the National Research Council of the National Academies (NRC) to review their use for different purposes. The following conclusion was stated in its report, *i.e.* The Polygraph and Lie-Detection: Committee to Review the scientific evidence on the Polygraph (Washington D.C.: National Academies Press, 2003) at pp 212-213:

> **Polygraph Accuracy:** Almost a century of research in scientific psychology and physiology provides little basis for the expectation that a polygraph test could have extremely high accuracy. The physiological responses measured by the polygraph are not uniquely related to deception. That is, the responses measured by the polygraph do not all reflect a single underlying process: a variety of psychological and physiological processes, including some that can be consciously controlled, can affect polygraph measures and test results. Moreover, most polygraph testing procedures allow for uncontrolled variation in test administration (*e.g.*, creation of the emotional climate, selecting questions) that can be expected to result in variations in accuracy and that limit the level of accuracy that can be consistently achieved.

Theoretical Basis: The theoretical rationale for the polygraph is quite weak, especially in terms of differential fear, arousal, or other emotional states that are triggered in response to relevant or comparison questions. We have not found any serious effort at construct validation of polygraph testing.

Research Progress: Research on the polygraph has not progressed over time in the manner of a typical scientific field. It has not accumulated knowledge or strengthened its scientific underpinnings in any significant manner. Polygraph research has proceeded in relative isolation

from related fields of basic science and has benefited little from conceptual, theoretical, and technological advances in those fields that are relevant to the psycho-physiological detection of deception.

Future Potential: The inherent ambiguity of the physiological measures used in the polygraph suggests that further investments in improving polygraph technique and interpretation will bring only modest improvements in accuracy."

20. A Working Party of the British Psychological Society (BPS) also came to a similar conclusion in a study published in 2004. The key finding is reproduced below, [Cited from: A review of the current scientific status and fields of application of polygraph deception detection – Final Report (6 October, 2004) from The British Psychological Society (BPS) Working Party at p. 10]:

"A polygraph is sometimes called a lie detector, but this term is misleading. A polygraph does not detect lies, but only arousal which is assumed to accompany telling a lie. Polygraph examiners have no other option than to measure deception in such an indirect way, as a pattern of physiological activity directly related to lyin g does not exist (Saxe, 1991). Three of the four most popular lie detection procedures using the polygraph (Relevant/Irrelevant Test, Control Question Test and Directed Lie Test, ...) are built upon the premise that, while answering so-called 'relevant' questions, liars will be more aroused than while answering so-called 'control' questions, due to a fear of detection (fear of getting caught lying). This premise is somewhat naive as truth tellers may also be more aroused when answering the relevant questions, particularly: (i) when these relevant questions are emotion evoking questions (*e.g.,* when an innocent man, suspected of murdering his beloved wife, is asked questions about his wife in a polygraph test, the memory of his late wife might re-awaken his strong feelings about her); and (ii) when the innocent examinee experiences fear, which may occur, for example, when the person is afraid that his or her honest answers will not be believed by the polygraph examiner. The other popular test (Guilty Knowledge Test,...) is built upon the premise that guilty examinees will be more aroused concerning certain information due to different orienting reactions, that is, they will show enhanced orienting responses when recognising crucial details of a crime.

This premise has strong support in psychophysiological research (Fiedler, Schmidt & Stahl, 2002)."

31.12 CONCLUSION

In our considered opinion, the compulsory administration of the impugned techniques violates the 'right against self-incrimination'. This is because the underlying rationale of the said right is to ensure the reliability as well as voluntariness of statements that are admitted as evidence. This Court has recognised that the protective scope of Article 20(3) extends to the investigative stage in criminal cases and when read with section 161(2) of the Code of Criminal Procedure, 1973 it protects accused persons, suspects as well as witnesses who are examined during an investigation. The test results cannot be admitted in evidence if they have been obtained through the use of compulsion.

Article 20(3) protects an individual's choice between speaking and remaining silent, irrespective of whether the subsequent testimony proves to be inculpatory or exculpatory. Article 20(3) aims to prevent the forcible 'conveyance of personal knowledge that is relevant to the facts in issue'. The results obtained from each of the impugned tests bear a 'testimonial' character and they cannot be categorised as material evidence.

We are also of the view that forcing an individual to undergo any of the impugned techniques violates the standard of 'substantive due process' which is required for restraining personal liberty. Such a violation will occur irrespective of whether these techniques are forcibly administered during

the course of an investigation or for any other purpose since the test results could also expose a person to adverse consequences of a non-penal nature. The impugned techniques cannot be read into the statutory provisions which enable medical examination during investigation in criminal cases, *i.e.*, the *Explanation* to sections 53, 53A and 54 of the Code of Criminal Procedure, 1973. Such an expansive interpretation is not feasible in light of the rule of '*ejusdem generis*' and the considerations which govern the interpretation of statutes in relation to scientific advancements. We have also elaborated how the compulsory administration of any of these techniques is an unjustified intrusion into the mental privacy of an individual. It would also amount to 'cruel, inhuman or degrading treatment' with regard to the language of evolving international human rights norms. Furthermore, placing reliance on the results gathered from these techniques comes into conflict with the 'right to fair trial'. Invocations of a compelling public interest cannot justify the dilution of constitutional rights such as the 'right against self-incrimination'.

In light of these conclusions, we hold that no individual should be forcibly subjected to any of the techniques in question, whether in the context of investigation in criminal cases or otherwise. Doing so would amount to an unwarranted intrusion into personal liberty. However, we do leave room for the voluntary administration of the impugned techniques in the context of criminal justice, provided that certain safeguards are in place. Even when the subject has given consent to undergo any of these tests, the test results by themselves cannot be admitted as evidence because the subject does not exercise conscious control over the responses during the administration of the test. However, any information or material that is subsequently discovered with the help of voluntary administered test results can be admitted, in accordance with section 27 of the Evidence Act, 1872.

The National Human Rights Commission had published 'Guidelines for the Administration of Polygraph Test (Lie Detector Test) on an Accused' in 2000. These guidelines should be strictly adhered to and similar safeguards should be adopted for conducting the 'Narcoanalysis technique' and the 'Brain Electrical Activation Profile' test. The text of these guidelines has been reproduced below:

(i) No Lie Detector Tests should be administered except on the basis of the consent of the accused. An option should be given to the accused whether he wishes to avail such test.

(ii) If the accused volunteers for a Lie Detector Test, he should be given access to a lawyer and the physical, emotional and legal implication of such a test should be explained to him by the police and his lawyer.

(iii) The consent should be recorded before a Judicial Magistrate.

(iv) During the hearing before the Magistrate, the person alleged to have agreed should be duly represented by a lawyer.

(v) At the hearing, the person in question should also be told in clear terms that the statement that is made shall not be a 'confessional' statement to the Magistrate but will have the status of a statement made to the police.

(vi) The Magistrate shall consider all factors relating to the detention including the length of detention and the nature of the interrogation.

(vii) The actual recording of the Lie Detector Test shall be done by an independent agency (such as a hospital) and conducted in the presence of a lawyer.

(viii) A full medical and factual narration of the manner of the information received must be taken on record.

31.12.1 Evidence Admissible[10]

> Insofar as the Polygraph [Lie Detection] Test which was conducted on A-2 is concerned, Mr. Sushil Kumar submits that since polygraph evidence is not subject of expert evidence as per section 45 of Evidence Act being a science in mystique, it could at best be used as an aid to investigation and not as evidence. In support of his submission, he has relied on *Romeo Phillion and Her Majesty The Queen,* (1978) 1 SCR 18 and *R. v Beland*, (1987) 2 SCR 398, which are decisions rendered by the Canadian Supreme Court, and on *Mallard v Queen*, 2003 WASCA 296, a decision of the Australian Supreme Court. Mr. Tulsi, on the other hand, submits that the result of Polygraph Test can be used against the accused. As there are other materials sufficient for upholding conviction of A-2, we refrain ourselves from going into the question of admissibility or otherwise of the result of Polygraph Test in the present case.

31.12.2 Lie Detector Evidence[11]

Another breakthrough has been made in the acceptance of polygraph (lie detector) evidence by courts. The Wisconsin Supreme Court, in a landmark decision on 4 April 1974, reversed its 40-year-old rule and decided that lie detector evidence was admissible in a criminal case. Polygraph evidence now has reached the same level of scientific reliability as evidence produced by the science of fingerprints, ballistics, voice-prints, and electroencephalographs, according to the court. This decision reverses the former rule in *Wisconsin, State v Bohner,*[12] which was first set out in the Federal case *Frye v United States.*[13]

In the *Stanislawski* case, an appeal was taken from a jury conviction for rape. A polygraph test had been administered both to S., and to the complaining witness by the police, but due to the law in Wisconsin at the time, results of the tests could not be introduced in court. (The tests showed the defendant to be telling the truth and the witness to be lying.) In overturning the conviction of S., the Supreme Court stated:

> Under the test of general acceptance of scientific standing in the field in which it belongs, there has been a marked change in acceptance of polygraph testing in the forty-plus years since *Bohner* and 50-plus years since *Frye*. There is a widespread use of polygraph testing by industries, banks, insurance companies, police departments, and governments, including the armed forces. The business of private polygraph examiners increased eight to ten times in the decade 1950-1960.
>
> The court further found:
>
> .....polygraph tests have moved..... to such degree of standing and scientific recognition that unconditional rejection of expert testimony based on polygraph testing is no longer indicated.

The new rules and qualifications of admissibility were adopted from a case decided by the Arizona Supreme Court in *State v Valdez.*[14] The results of a lie detector examination were admissible for two purposes:

> .....to corroborate other evidence of a defendant's participation in the crime charged" and, "If he takes the stand such evidence is admissible to corroborate or impeach his own testimony.

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10. *Ram Singh . Sonia,* Appeal (Crl) 895 of 2005 [Bench: B.N. Agrawal & P.P. Naolekar], decided on 15 February 2007.
11. King, D.P. 1974, Case Notes, USA Criminologist. 9 (34), 39; *State v Stanislaw Ski,* 62 Wis 2d 730 (1974), Wisconsin Supreme Court.
12. 210 Wis 651 (1933)
13. (1923) 54 App DC 46 : 293 F 1013 (DC Cir 1923).
14. 91 Ariz 274 (1962).

The court set up four conditions which must be met before such testimony is admitted:

1. That the district attorney, defendant and his counsel all sign a written stipulation providing for defendant's submission to the test and the subsequent admission at trial of the graphs, and the examiner's opinion thereon on behalf of either defendant or the State.
2. That notwithstanding the stipulation to admissibility of the test results is subject to the discretion of the trial court, *i.e.,* if the trial judge is not convinced that the examiner is qualified or that the test was not conducted under proper conditions he may refuse to accept such evidence.
3. That if the graphs and examiner's opinion are offered in evidence the opposing party shall have the right to cross-examine the examiner respecting:
   (a) the examiner's qualifications and training;
   (b) the conditions under which the test was administered;
   (c) the limitations of and possibilities for error in the technique of polygraph interrogation; and
   (d) at the discretion of the trial court, any other matter deemed pertinent to the enquiry.
4. That if such evidence is admitted the trial judge should instruct the jury that the examiner's testimony does not tend to prove or disprove any element of the crime with which a defendant is charged but at most tends only to indicate whether at the time of the examination defendant was telling the truth. Further, the jury members should be instructed that it is for them to determine what corroborative weight and effect such testimony should be given.

The Wisconsin decision was the further step in the increasing acceptability of polygraph evidence in U.S. Courts.

CHAPTER 32

NARCO-ANALYSIS INTERROGATION

(TRUTH SERUM TEST)

SYNOPSIS

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32.1 GENERAL

32.1.1 Definition

Narco-analysis is a chemo-physiological test administered to a crime suspect to extract truth when he is not willing to tell the truth and tell lies in normal interrogation. It is an interrogation of a suspect, after giving him an injection, intravenously, of a suitable dose of a psychoactive (hypnotic) drug — a barbiturate most of the time. Usually the barbiturate is **Sodium thiopentothal**[1] or **Sodium Amytal**[2] (**Amobarbital**). The injection is administered under controlled conditions to reduce or eliminate the reasoning power of the subject without affecting his memory. Diazepam compound notably benzodiazepine is considered safer. However, in India sodium pentothal is the drug used generally. The narcotic affects adversely that part of the brain of the subject, which discriminates between what is good or bad for him; according to his own values and thinking. In short, the drug suppresses his thinking and reasoning powers.

The narcotic used for the purpose is given the fancy name of Truth Serum by the story writers and media persons to attract attention. They also name the process as Truth Serum Test. In India, the word is "Narco".

1. It is the most common barbiturate used in narco-analysis. It is ultra-short acting barbiturate and the effects last only for a few minutes. It causes a state of semi-consciousness in the subject.
2. The barbiturate makes the person more talkative. He may thus reveal truth.

32.1.2 Basis

The fact that certain materials affect the brain has been known since ancient times. Alcohol[3], opium, cannabis and some other substances have been used or misused from prehistoric times almost all over the world. The use of barbiturate in controlling brain functions, under controlled conditions, is an extension of the process in a purpose-specific mode for interrogating refractory subjects. Formerly, the people did not understand the mechanism of the action of these drugs on man. Now they know how they work.

The brain affecting chemicals enter the brain through circulating blood. They affect certain parts of the brain preferentially. Researchers have found which drug effect which part and with what results. For interrogation, they found drugs which suppress the reasoning power but not the memory or speech equally. They found that Sodium Pentothal is, so far, the drug of choice for the purpose. However, the research is going on and it is hoped that still better drugs may come up in the near future. Or, some newer techniques of interrogation may come up and make the Narco-analysis techniques redundant.

32.1.3 Presumptions

Narco-analysis is based upon certain presumptions. These presumptions do not necessarily hold good in all cases. Where they hold well, the analyst gets useful results, but if they fail, not only the results are useless, but they are sometimes harmful. They mislead investigations.

The common presumptions about Narco-analysis are:

1. The hypnotic or other drug injected in the body suppresses the reasoning power of the subject to an extent that his answers are from memory without any effort to appraise. Rationalise or suppress the truth. It is not so always.

The human body including the brain is such that it varies from person to person. The dose administered to a person may or may not suppress his reasoning power and other faculties.

> *A very senior officer, who was a teetotaler, once related a personal experience. His friends asked him to drink half a bottle of whisky (about 375 ml.) and drive a vehicle for about 25 kilometres. He did it! (CH)*

Or, it may suppress the power only partially and the subject is able to fib; to save his skin, if he so desires. Clever criminals often pretend that they are in the 'desired' trance and mislead the examiner with a bundle of lies. The sub-presumptions are:

2. The subject has not mixed the truth about the event with his imagination, fantasies or other similar incidents.
3. He has not rationalised the events of the occurrence in his subconscious mind.
4. He is not influenced by the media versions or by the versions of his near and dear ones.
5. He is not under Conformational Syndrome.[4]
6. He has a sharp and long-lasting memory and can recall the events even under the influence of the drugs.
7. He tells lies to save himself when not drugged.
8. The dose of the hypnotic drug is adequate to numb his reasoning power and that the effect of the drug lasted for the whole interrogation interval. It may be mentioned

3. Police still use it on some subjects to make them more talkative and to reduce their inhibitions.
4. He is not conforming mechanically to what is put up to confirm.

that the drug commonly used in India (Sodium Pentothal) in an ultra-short acting drug and its effect lasts only for a few minutes. The examiner must complete the interrogation in that small interval.

9. The examiner is an unbiased competent expert and has framed non-suggestive questioned which can elicit the correct information which is not based on his suggestions.

The failure of one or more of these assumptions at times has created an ongoing controversy:

1. Is psychoanalysis scientific?
   - Are the findings, based upon recognised scientific principles?
   - Are the techniques recognised, evaluated and approved by the concerned scientific fraternity?
   - Have the tools and techniques been reviewed by senior scientists in the fields?
   - Are the margins of errors known? Have they been taken into consideration?
2. Is it another mode of Third Degree Methods or torture?
3. Should its findings be used as evidence in courts? Or, should they be used only in the investigation process.
4. Does it violate article 20(3)[5]: (No person can be compelled to be a witness against himself) of the constitution?

These controversies have adversely affected the utilisation of the Narco-analysis in the fight against crime. Half-baked courts' decisions have added fuel to the fire. It is true that Narco-analysis has lacunae. However, with more inputs in the form of research, they could be overcome and a state of workable trance can be obtained.

32.2 PROCESS

32.2.1 Narco-analysis Interrogation

As already seen Narco-analysis is an interrogation technique under modified mental conditions of the subject, to prevent him from telling lies. The preliminaries, prior to the administering Narco-analysis test, are:

- Permission for the test is obtained from a magistrate.
- Consent of the subject is recorded to satisfy the need of article 20(3) of the Constitution and that of Supreme Court directions that the subject is not being compelled to undergo the test.
- Fitness of the subject, to undergo the test, is checked by a general physician. He gives a certificate thereof.

32.2.2 Narco-analysis Room

The test is carried out in an operation theatre, ordinarily, so that in case need arises medical assistance can be provided to the subject. A general physician keeps a watch on the subject and an anaesthetist who administers the drug are the only persons present in the room in addition to the narco-analyst. The room is free from noise and other disturbances.

5. Article 20(3): "No person accused of an offence can be compelled to be a witness against himself." Administering hypnotic is not compelling the accused to be a witness against himself. Refer to full Bench of the Supreme Court in *State of Mumbai v Kathi Kal*u, (1961) 2 Cr LJ 856 (SC).

32.2.3 The Drug

The drug for Narco-analysis interrogation is usually Sodium Pentothal in the form of 0.01 per cent solution in pure water. An anaesthetist injects it intravenously, in a vein on the back of the hand, slowly. The dose is usually 0.25 to 0.50 gram. In some cases, the dose may be even one gram. The anaesthetist determines the quantity of the dose to ensure creation of a trance-like state in the subject. He monitors and modulates the degree of unconsciousness during the interrogation.

Dose strength is the most critical part of the test. Excess dose can kill the subject and a lighter dose will not create the desired semi-conscious state. In such a case, the subject may pretend that he is in trance, without being so. He then gives answers to mislead the investigator, explicate himself and may implicate some other person(s). If the desired trance is achieved, he answers questions without deliberations. These answers are believed to be truthful.

The drug dose varies from person to person and depends upon his health, will power and his attitude towards life in general and to the test in particular. The anaesthetist takes age, weight and general built into consideration while determining the dose for a particular subject.

32.2.4 The Subject

The subject has to be in good mental and physical health. A general medical practitioner certifies the same after carrying out medical examination and bio-medical test if necessary. He should be free from heart diseases, diabetes, blood pressure, liver, and kidney problems. In case of women subjects they should not be pregnant or lactating mothers at the time of Narco-analysis interrogation.

The subject must not be a drug addict or on barbiturates therapy. The subject should not be suffering from depression.

The subject is acclimatised to the environment before he is given the test.

32.2.5 The Examiner

The narco-analyst, a Forensic Psychologist, takes over the subject once semi-conscious state is achieved. The psychologist has already studied the circumstances of the case, obtained all the details of the investigative findings and knows the aim of interrogation. Further, the analyst, in an informal chat, familiarises the subject with the various aspects of the test prior to examination. In short, he removes the fears of the test of the subject.

He prepares a questionnaire beforehand to extract the desired meaningful information from the subject.

The anaesthetist and the psychologist (sometimes a psychiatrist also) work in the presence of the general physician who had certified the physical fitness of the subject not only to take the narco-analysis interrogation before starting the test but he, after the test also certifies that there is no adverse effect of the test on the subject.

Narco-analysis interrogation is teamwork. Usually, the team consists of three persons mentioned above: the medical professional, the anaesthetist and the forensic psychologist.

An imaging expert takes video and audio films of the process and he records the other details of the test. The film so prepared form part of the report submitted to the courts or sent to the requisitioning authorities.

32.2.6 Sources of Errors

In spite of the fact that the effect of drugs on the human brain is known from time immemorial, there is insufficient research on the process. There are deficiencies and pitfalls, real or imaginary, in Narco-analysis interrogation, including the following:

1. There is no sure test to indicate that the trance is real or fake.
2. There is no guarantee that the subject is not just accepting the suggestions of the examiner or telling what he has done or seen.
3. There is no surety that the subject is giving facts or mixing them with lies.
4. The subject may intermingle the present incident with some other incident.
5. There is no way to know if the subject is relating to non-existing imaginary incidents, which he believes to be true in a normal state of mind. The result of interrogation may be the outpourings of such events.
6. There is no statistical base for the validity of the test.
7. There is no general acceptance of narco-analysis.
8. The answers of the suspect may be the result of disorientation of the brain and interrogation results may be the outcome of some delusion, hallucinations, etc.
9. The subject may be suffering from hyper amnesia and give self-created details.
10. The subject, in normal interrogation, is told repeatedly: "**you have done it"**. In Narco-analysis interrogation, he remembers the statement and accepts it: "**I have done it"** though he may not have done it.
11. It is alleged that Narco-analysis interrogation suffers from Conformational Syndrome: the specialist gives what the investigators want. However, it is not so. Bangalore Laboratory results showed that narco-analysis interrogation, in about 25% cases the subjects were found innocent of the crimes they were accused of.

32.2.7 Laboratories

Two State Forensic Science Laboratories: one at Bengaluru (Bangalore) and the other at Ahmedabad have facilities to carry out narco-analysis interrogation in India. The former carries out the test at Victoria Hospital, Bengaluru. The reports of the Bengaluru Laboratory are highly encouraging. It reports a very high rate of success in the tests. About a thousand persons have already undergone Narco-analysis interrogation.

32.3 IMPORTANCE

Narco-analysis is an interrogation technique to get correct and truthful information from the subject who does not furnish correct information under normal interrogation.

32.3.1 Ned

There are many reasons for which he does not tell the truth including the following:

1. To avoid incrimination
2. Fear of reprisals from the adversely affected party
3. Nervous breakdown from the recall of the horrid incident

Two girls were walking at dusk in an unfrequented area in a small town, in UK. They were attacked by a person. He killed one and raped the second. The latter was shell-shocked, could not give the details of the culprit, and would go unconscious on questioning. She was put under hypnosis. She gave complete details.

The face of the culprit was reconstructed from the details she gave on interrogation under hypnosis. When the reconstructed sketch of the face was shown to her, she at once exclaimed that he was the culprit. (CH)

4. Mind going blank due to emotional shock

In such cases, the help of Forensic Psychology is indispensable. It may be hypnosis, narco-analysis or some other technique. The varied techniques have their own plus and minus points.

32.3.2 Applications

Narco-analysis is used in many crime situations including the following:

1. **Interrogation of spies**: spies are a special category of subjects, *via-a-vis* interrogation. They are specially trained foreign (government) agents sent to other countries to gather secret and classified information. Their training includes how to face (and counter) interrogation when they are caught. The training toughens them so much that most of the methods of interrogations fail. In such cases, Narco-analysis has given positive results.
2. **Interrogation of terrorists:** terrorists are another class of criminals who are highly motivated. They resist normal interrogations. The effective way to extract information from them is by putting them in trance and gets details about their past, present and also of future plans.
3. **Interrogation of revolutionaries:** revolutionaries are dedicated individuals. They are thoroughly brainwashed. Their usual interrogation often fails. Narco-analysis interrogation often provides the needed information to check their ongoing and future depredations and to know the details of the past attacks.
4. **Interrogation of religious and racial fanatics:** religious and racial fanatics are a species apart. They are under the hypnotic spell of wrong religious fervour. This spell is overcome through narco-analysis interrogation. The narco-analysts have used narco-analysis in some cases[6] in India, with success.
5. **Interrogation of psychopathic and schizophrenic criminal:** psychopathic and schizophrenic criminals sometimes appear on the horizon. They are also difficult subjects for interrogations. Schizophrenic criminals are especially so because of their secretive nature, careful planning and self-preservation instinct. Narco-analysis proves effective with them.

   The use of hypnotics to get detailed and correct information started with Psychopathic patients as part of their treatment procedure. It has since been used extensively to interrogate criminals. The use of the technique is now limited in psychiatric investigations for the treatment.
6. **Interrogation of scam scoundrels:** in the past one decade India has been flooded with scam scoundrels of all sorts. Scams are results of corrupt practices and give rise to black money and money laundering, etc. in addition to raining a host of other evils.

   The perpetrators (ministers, business tycoons, bureaucrats, organised crime syndicates, etc.) of the scams are powerful men with bags of money and lots of influence. They easily manipulate the normal investigative and interrogation process. Narco-analysis interrogation can help to get information from such persons.
7. **Interrogation of cybercriminals: t**he cybercrimes do not provide the usual evidence against the criminal. Interrogation plays an important role in collecting evidence. But the cyber criminals feel smug that they can get away with the hi-tech crime. Narco-analysis interrogation proves useful in many cybercrime investigations.

32.3.3 Investigative Help

Narco-analysis interrogation, under favourable conditions, can help the investigator in many ways, including finding answers to the following questions:

6. In Godhara Kand and Malegaon cases the investigation were facilitated by Narco-analysis.

1. Is the subject under scan a criminal; or an associate/sympathiser/member of a criminal gang? Or, is he an innocent person?
2. Is he a serial criminal? If so, where, when and how did he commit the crimes? What was the chronology of the serial crimes?
3. Who were/are the victims?
4. What was his role in the incident(s)?
5. What are the evidentiary clues he picked up or left at the crime scene?
6. How has he disposed off the body?
7. Where has he hidden the *corpus delicti*?
8. Who were his associates?
9. What were his motives for the crime(s)?
10. Is he a psychopath?

In short, Narco-analysis interrogation, under favourable conditions, can bring out the true confession from the culprit and extract information on most of the aspects of the crime, which he may not be able to get through normal interrogation.

32.4 SUCCESS STORIES

Narco-analysis interrogation is not used widely in the world. The main reason for the neglect is that the process has not received general acceptance, both from the legal community and the scientific fraternity. The subject has not been researched extensively. Consequently, lacunae and oddities exist, which need ironing out through extensive research.

Narco-analysis involves the human brain, which is highly complex. It is responsible for all the human activities: observations, storage, remembering and recall of the information, rationalisation, thinking and action, etc. All its processes are influenced by emotions, motives, needs, attitudes and of course by life experiences, education, association and environment. The results vary from man to man, time to time and from situation to situation.

Narco-analysis is based on the assumption that the process suppresses, through narcotics, most of the brain activities, leaving, ideally, only recall and speech power. The success to reach the ideal state of trance varies with subjects, with the specialist and with the nature of the incident and circumstances of the case. In India, Karnataka State Laboratory has carried out the maximum number of Narco-analysis interrogations. The laboratory has reported/claimed exceptional success (rate: > 90 %). They have interrogated hundreds of criminals with success. Some of the success stories, in India, are given here.

We have some success stories in narco-analysis:

32.4.1 Bombay Serial Blast, 1993

Abu Salem masterminded the Mumbai Serial Blasts, 1993. He was part of the gang of Don Dawood Ibrahim. He carried out murders, extortions and kidnapping on a large scale and was wanted in many cases. He has amassed property worth hundreds of crores of rupees. After his separation from Dawood, he had to run away from India and Dubai. Interpol arrested him and his wife, Monica Bedi, in Lisbon in 2002. Both were extradited to India in 2005 under certain conditions. He was convicted for Mumbai Serial Blast and lodged in high-security Arthur jail.

Narco-analysis interrogation was used to find details of the 1993 blast and other cases carried at the State FSL Bengaluru by a team of specialists, consisting of a medical doctor, an anaesthetist and a Forensic Psychologist. A lot of useful information could be elicited from him.

Fig. 32.1

Changing faces of Abu Salem, from a petty criminal to Don of Mumbai underworld

32.4.2 Stamp Paper Scam

Abdul Karim Telgi masterminded the commission of the greatest forgery of our times, money-wise and area of operation-wise, infamous as the Stamp Paper Scam. He was subjected to Narco-analysis interrogation in December 2003 in State FSL Bengaluru. Telgi provided a lot of information about his *modus operandi*, his associates and his sale network of fake stamps over various parts of the country which helped to unravel the *modus operandi* and the personalities involved. He accomplished the most profitable forgery, guzzling more than thirty thousand crores of rupees and ensnaring hundreds of persons to be involved in the magnum forgery.

Fig. 32.2

Abdul Karim Telgi, who masterminded the stamp paper scam

32.4.3 Nithari Serial Murders

In 2005 and 2006**,** serial murders took place in Nithari village near Noida, UP, in the house of Moninder Singh Pandher a transporter. Bodies or parts thereof of sixteen girls were recovered from a nearby drain. He and his servant, Surender Koli, both were accused, tried, convicted and sentenced to death, relating to four victims, by the trial judge[7] on 13 February 2009. The judge dubbed it as the

rarest of the rare cases.

7. The High Court, Allahabad, acquitted Pandher. He is still an accused in other cases.

In January 2015, Koli's death penalty was commuted to life imprisonment by the High Court. Koli has been confined in Dasna jail ever since his arrest in December 2006.

A Ghaziabad CBI court awarded death sentence to Nithari case convict Surinder Koli in the murder of a 14-year-old girl. This is the tenth death sentencing for Koli while hearing is still going on in six remaining cases.[8]

Fig. 32.3

Surender Koli, main accused in the Nithari serial murders gave extensive information on narcoanalysis interrogation

During an investigation of the serial murders, the two accused were subjected to Narco-analysis interrogation successfully in the Gujrat State FSL, at Gandhinagar. The interrogation gave useful information. The result of the test indicated that Koli had done the killings alone, by strangulating the victims. It was also revealed that after killing Koli would rape the victims, dismember them in his bathroom and then throw them in the drain.

He could give the names of most of the victims under the influence of the drug.

According to Koli, Pandher did not take part in the killings. The Narco-analysis interrogation of Pandher, however, found that he was a womaniser and under depression.

32.5 NARCO-ANALYSIS AS SCIENCE

Science has been defined as organised knowledge on any subject. It starts with an idea, often called a hypothesis. This hypothesis is then tested through experiments or studying natural phenomena. Observations are made. If the observations in a number of experiments or natural phenomena are in consonance with the conceived hypothesis, the hypothesis is dubbed as theory. The scientific fraternity explores the theory further. If most of them find the theory consistent, the theory is called law or principle, usually after general acceptance.

Let us apply the same criteria to Narco-analysis interrogation, to see if it is a science or not.

The psychiatrists discovered that hypnotics create a trance-like state in humans, long ago. They used them on their mental patients to understand their mental problems through hypnotics which created a semi-conscious state. Forensic Psychologist took the cue and started experimenting with barbiturates (hypnotics) to create the twilight state in untruthful subjects (mostly criminals, some frightened (liar) witnesses or victims). The experimental work, the observations and drawing of inferences about the hypnotics in this context are still going on to:

8. Times of India, 2 March 2019.

- Find better and better hypnotics.
- Establish parameters to determine the dose.
- Determine the best conditions to carry out the process.
- Ascertain and clear obstructions or hindrances to get at the truth.
- Find the margin of errors, and eliminate their sources.

The narco-analysis, thus, follows the scientific processes. It is, therefore, a science. However, most of the persons (investigators, lawyers, judges and sensationalist media persons) who have to deal with Narco-analysis are not aware what science or its processes are. Some others, who are benefitted by its exclusion including crime syndicates, refuse to accept Narco-analysis as a science. It is unfortunate!

32.6 LEGAL MUDDLE

Narco-analysis interrogation is riddled with many legal controversies. The main legal issues, discussed in Indian courts, are:

1. Supreme Court Judgment[9] on Narco-analysis interrogation
2. Narco-analysis interrogation infringes/does not infringe Article 20(3) of the Constitution.
3. Narco-analysis interrogation tantamount to III Degree treatment of the subject
4. Narco-analysis interrogation is or is not in the ambit of Evidence Act.
5. Whose rights, of the criminal or of the public, are paramount?
6. Narco-analysis interrogation is an invasion of the privacy of the subject.

These issues have to be viewed dispassionately if Narco-analysis interrogation has to be accepted or rejected as a tool of investigation or a potent source of evidence in courts.

32.6.1 Supreme Court on Narco-analysis

In 2010, a Bench of Supreme Court of India headed by the then Chief Justice of India who wrote the judgment (251 pages!) in which they have commented upon Narco-analysis and on other new branches of Forensics.

The salient features of the judgment, *vis-à-vis* Narco-analysis interrogation are:

1. The Narco-analysis interrogation to be done only with the consent of the subject before a magistrate.
2. Nobody to be forced to undergo the test involuntarily.
3. The material and other evidence derived from the Narco-analysis interrogation can be used as evidence under section 27 of the Indian Evidence Act.
4. Direct evidence from the narco-analysis interrogation (confession!) is inadmissible unless supported by other evidence.
5. Involuntary interrogation amounts to III degree methods and the court cannot permit such tests.
6. The compelling public interest cannot justify ignoring right against self-incrimination.

9. *Mst. Selvi v State of Karnataka,* AIR 2010 SC 1974 : 2010 AIR SCW 3011 : (2010) 7 SCC 263.

7. Parliament may make law to make the test admissible in compelling public interest cases.

The only setback to the police is that involuntary **n**arco-analysis interrogation is not allowed. It is unfortunate that in serious crimes where it is needed most and where hardened criminals are involved who would not consent to take the test; the police is deprived of the scientific facility.

It is equally unfortunate that the state governments failed to put up facts before the court completely and lucidly to show that even involuntary narco-analysis interrogation is not unconstitutional for the following reasons:

1. Narco-analysis interrogation is carried out by a Forensic Psychologist. He just unravels the memory. The information so extracted may explicate (or implicate) the subject. The psychologist does not know its value, nor does he care for the same. He just records it through audio and video films. It becomes evidence only when the investigator evaluates it *vis-à-vis* the circumstances of the case.

   In the infamous Nithari serial murders, narco-analysis interrogation indicated that Pandher did not take part in the murdering process!

2. The blood from a suspect is drawn with a syringe needle day in and day out for identifying murderers, rapists and other sex criminals, for determining disputed paternity, and for other serious or petty crimes. No court has ever declared such blood drawl as unconstitutional. Rather they have ordered drawl of blood in many a case. (In Tewari's Disputed Paternity case when he refused to give blood court ordered to take the blood forcibly). In Narco-analysis interrogation, the anaesthetist uses a syringe only to inject a hypnotic which is also used in therapy.

   We cannot have two standards for the dissemination of justice. If the use of needle is constitutional in one type of cases, it has to be so in other type of cases also.

3. It is unfortunate that it was not brought to the notice of the court that during narco-analysis interrogation, the drug does not cause any pain to the subject. Rather the subject is relieved of any pain or worry from which the subject might have been suffering. By no stretch of imagination one can equate Narco-analysis interrogation with III Degree methods. It is unfortunate the prosecution failed to explain/convince the court.

4. The Supreme Court in an earlier judgment[10] has clarified that:

   Article 20(3) "**does not say that an accused person cannot be compelled to be a witness".** It says that such a person **"cannot be compelled to be witness against himself".**

   The question therefore is whether the accused is "furnishing evidence" against himself. If we consider the extraction of evidence from memory layers by scientific methods then where is the question of the subject furnishing the evidence? He is not furnishing any evidence. It is being taken into possession like other evidence (fingerprints or footprints from an unwilling accused). As taking of fingerprints or footprints does not attract infringement of article, 20(3) Narco-analysis interrogation also does not infringe the article of the Constitution.

It is unfortunate that the scientific facts and parity of the evidence with other evidence were not brought to the notice of the court to prevent injustice to narco-analysis interrogation.

32.6.2 Narco-analysis and Article 20(3) of Constitution

Article 20(3) of the Indian Constitution has the statement:

No person accused of an offence can be compelled to be a witness against himself

10. *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).

The relevant contents of the above have two elements: firstly

no person accused of an offence can be compelled

and secondly,

to be a witness against himself.

It is true that most of the persons put to narco-analysis interrogation are accused of some offence(s). However, they are neither compelled nor are they witness against themselves.

No one is compelled to give evidence against himself. In fact the consent of the subject is taken before he is subjected to Narco-analysis interrogation. In a recent case[11] the Gujarat Laboratory refused to carry out Narco-analysis interrogation because the accused refused to give consent for the test. Thus, there is no compulsion to undergo the test. Further, the accused persons are often ready to undergo the test to get them explicated of the accusation.

In Nithari serial murders there were two accused; Surrender Koli and Mohinder Singh Pandher. Both girls. (CH)

The subject undergoing narco-analysis interrogation is not a witness against himself. In fact, information is being extracted from him like other evidence: blood for DNA analysis, fingerprints and footprints for comparison, etc. The law has allowed extracting the latter types of evidence even forcibly, against his will.

Further, the information is not evidence until it is evaluated and compared with the circumstances of the cases. The evaluation may even exonerate the subject as has happened to Mohinder Singh Panther in the notorious Nithari serial killing case.

In narco-analysis interrogation, the accused does not become a witness against himself. He does not give the information. The information is extracted from his memory by scientific methods by scientists following standard procedures. The evidence obtained is just like the evidence extracted from the accused in murder, rape or other cases in which the culprit leaves blood, flesh, skin, saliva, etc. at the crime scene or with the victim. Information of the source is obtained only when blood is extracted from the accused, analysed and matched with the corresponding data from the incriminating evidence. Both the enacted and case law has allowed the practice. In some cases, even courts have ordered extraction of blood.[12]

Extraction of evidence through narco-analysis interrogation by qualified scientists under proper condition has to be treated at par with the blood extraction of blood evidence if we want to avoid the charge of ignorance, bigotry and judicial chauvinism.

The utility and acceptance, by the courts, of the evidence has to depend upon the quality of evidence, its proper processing and presentation.

In short, narco-analysis interrogation does not infringe the sub-article 20(3) of the Indian Constitution.

32.6.3 Narco-analysis: New *Avatar* of III Degree Methods

Narco-analysis interrogation is no new *Avatar* of III Degree methods. In fact, as already seen, it gives relief from pain and worry and thus acts as a calming balm to the subject. Those who call Narco-analysis interrogation as a new type of III degree mode are perhaps unaware that the drug used in Narco-analysis interrogation is a barbiturate which is a therapy drug normally given to calm down agitated (stressed) persons. It does not inflict any pain; instead, it eliminates pain and worry. Consequently, it is blasphemy to equate it with III degree methods.

11. *State FSL Gandhinagar; Rao* case.
12. In *N.D. Tewari's* case on refusal to give blood, Delhi High Court ordered him to furnish blood.

32.6.4 Rights of Public Paramount

One can understand that no innocent person should be convicted but does our Constitution or lawmakers intend that the criminal be let loose on public on flimsy grounds? Whose interest the government, the legislature and the judiciary watch and protect, of the teaming millions or of a handful of criminals? There can be no two opinions or answers to this question. The interest of the public takes precedent.

Science has made tremendous progress in recent times. The criminal is using science to the hilt to carry out his nefarious activities. The law keepers are hindered from using modern science: flimsy law points, corruption, avoidable administrative delay, low priority to modernise scientific investigations, etc. Consequence: the criminal gets away with the crime; which emboldens not only him but also others with criminal tendencies. Most of the criminals in heinous crime are acquitted, because:

1. Wrong notions of law and justice
2. Topsy-turvy priorities of the government and of various wings of criminal justice system
    - The government does not create adequate scientific facilities including scientific manpower
    - The police dance attendance upon VIPs instead making the criminal do the dancing.
3. Prosecutors give free hand to the defence lawyers (and courts) for many reasons.
4. The judges are bound to old order. Some years ago a trial judge remarked, "Let me explode the myth of scientific evidence once forever," Others go on prolonging cases for years, again, for many flimsy reasons.

The sorry state of affairs continues.

The public interest is paramount. If the privacy of the culprit, who has shattered the home life of the victim, suffers; nothing is lost. Likewise, if the culprit has to suffer some inconvenience, no harm is done. The subject has to bear such burdens if the public interest, at large, has to be paramount.

32.7 CONCLUSION

Narco-analysis interrogation is a scientific technique. It is not another Avatar of III Degree Methods. The drug (a barbiturate) used is hypnotic. It involves no mental and physical torture of the subject. Rather it relieves the subject from pain and worries while its effect lasts. The interrogation lasts only for minutes at a time.

Narco-analysis has proved its utility in many a case. It is no invasion into the privacy of the subject as the examiner asks questions relating to the offence(s) in hand and there is no wild goose chase.

Narco-analysis has some oddities, which are being tackled by the scientists and are being removed with the passage of time.

32.8 ADDITIONAL READINGS

1. Directorate of Forensic Sciences, *Narco-analysis Laboratory Procedure Manual,* MHA, GoI, New Delhi.
2. VL Rowland, B, *Truth Serum in Encyclopaedia of Espionage,* Gale Cengage Publishers, USA.

32.9 CASE LAW

32.9.1 Supreme Court on Narco-analysis in 21st Century[13]

1. The legal questions in this batch of criminal appeals relate to the involuntary administration of certain scientific techniques, namely narco-analysis, polygraph examination and the Brain Electrical Activation Profile (BEAP) test for improving investigation efforts in criminal cases.

This issue has received considerable attention since it involves tensions between the desirability of efficient investigation and the preservation of individual liberties. Ordinarily the judicial task is that of evaluating the rival contentions in order to arrive at a sound conclusion. However, the present case is not an ordinary dispute between private parties. It raises pertinent questions about the meaning and scope of fundamental rights, which are available to all citizens. Therefore, we must examine the implications of permitting the use of the impugned techniques in a variety of settings.

2. Objections have been raised in respect of instances where individuals who are the accused, suspects or witnesses in an investigation have been subjected to these tests without their consent. Such measures have been defended by citing the importance of extracting information which could help the investigating agencies to prevent criminal activities in the future as well as in circumstances where it is difficult to gather evidence through ordinary means. In some of the impugned judgments, reliance has been placed on certain provisions of the Code of Criminal Procedure, 1973 and the Indian Evidence Act, 1872 to refer back to the responsibilities placed on citizens to fully co-operate with investigation agencies. It has also been urged that administering these techniques does not cause any bodily harm and that the extracted information will be used only for strengthening investigation efforts and will not be admitted as evidence during the trial stage. The assertion is that improvements in fact-finding during the investigation stage will consequently help to increase the rate of prosecution as well as the rate of acquittal. Yet another line of reasoning is that these scientific techniques are a softer alternative to the regrettable and allegedly widespread use of 'third degree methods' by investigators.

3. The involuntary administration of the impugned techniques prompts questions about the protective scope of the **'right against self-incrimination',** which finds place in Article 20(3) of our Constitution. In one of the impugned judgments, it has been held that the information extracted through methods such as 'polygraph examination' and the 'Brain Electrical Activation Profile (BEAP) test' cannot be equated with 'testimonial compulsion' because the test subject is not required to give verbal answers, thereby falling outside the protective scope of Article 20(3). It was further ruled that the verbal revelations made during a Narco-analysis test do not attract the bar of article 20(3) since the inculpatory or exculpatory nature of these revelations is not known at the time of conducting the test. To address these questions among others, it is necessary to inquire into the historical origins and rationale behind the 'right against self-incrimination'. The principal questions are whether this right extends to the investigation stage and whether the test results are of a 'testimonial' character, thereby attracting the protection of article 20(3). Furthermore, we must examine whether relying on the test results or materials discovered with the help of the same creates a reasonable likelihood of incrimination for the test subject.

4. We must also deal with arguments invoking the guarantee of '**substantive due process'** which is part and parcel of the idea of 'personal liberty' protected by article 21 of the Constitution. The first question in this regard is whether the provisions in the Code of Criminal Procedure, 1973 that provide for 'medical examination' during the course of an

13. *Mst. Selvi v State of Karnataka,* AIR 2010 SC 1974 : 2010 AIR SCW 3011 : (2010) 7 SCC 263.

investigation can be read expansively to include the impugned techniques, even though the latter is not explicitly enumerated. To answer this question, it will be necessary to discuss the principles governing the interpretation of statutes in light of scientific advancements. Questions have also been raised with respect to the professional ethics of medical personnel involved in the administration of these techniques. Furthermore, article 21 has been judicially expanded to include a 'right against cruel, inhuman or degrading treatment', which requires us to determine whether the involuntary administration of the impugned techniques violates this right whose scope corresponds with evolving international human rights norms. We must also consider contentions that have invoked the test subject's 'right to privacy', both in a physical and mental sense.

5. The scientific validity of the impugned techniques has been questioned and it is argued that their results are not entirely reliable. For instance, the Narco-analysis technique involves the intravenous administration of sodium pentothal, a drug, which lowers inhibitions on part of the subject and induces the person to talk freely. However, empirical studies suggest that the drug-induced revelations need not necessarily be true. Polygraph examination and the BEAP test are methods, which serve the respective purposes of lie-detection and gauging the subject's familiarity with information related to the crime. These techniques are essentially confirmatory in nature, wherein inferences are drawn from the physiological responses of the subject. However, the reliability of these methods has been repeatedly questioned in empirical studies. In the context of criminal cases, the reliability of scientific evidence bears a causal link with several dimensions of the right to a fair trial such as the requisite standard of proving guilt beyond reasonable doubt and the right of the accused to present a defence. We must be mindful of the fact that these requirements have long been recognised as components of 'personal liberty' under Article 21 of the Constitution. Hence, it will be instructive to gather some insights about the admissibility of scientific evidence.

32.9.2 Narco-analysis Technique

41. This test involves the intravenous administration of a drug that causes the subject to enter into a hypnotic trance and become less inhibited. The drug-induced hypnotic stage is useful for investigators since it makes the subject more likely to divulge information. The drug used for this test is sodium pentothal, higher quantities of which are routinely used for inducing general anaesthesia in surgical procedures. This drug is also used in the field of psychiatry since the revelations can enable the diagnosis of mental disorders. However, we have to decide on the permissibility of resorting to this technique during a criminal investigation, despite its' established uses in the medical field. The use of 'truth-serums' and hypnosis is not a recent development. Earlier versions of the Narco-analysis technique utilised substances such as scopolamine and sodium amytal. The following extracts from an article trace the evolution of this technique, [Cited from: C.W. Muehlberger, 'Interrogation under Drug-influence: The so-called Truth serum technique', 42(4) The Journal of Criminal Law, Criminology and Police Science 513-528 (Nov-Dec. 1951) at pp 513-514]:

> *With the advent of anaesthesia about a century ago, it was observed that during the induction period and particularly during the recovery interval, patients were prone to make extremely naive remarks about personal matters, which, in their normal state, would never have revealed.*

Probably the earliest direct attempt to utilize this phenomenon in criminal interrogation stemmed from observations of a mild type of anaesthesia commonly used in obstetrical practice during the period of about 1903-1915 and known as 'Twilight sleep'. This anaesthesia was obtained by hypodermic injection of solutions of morphine and scopolamine (also called 'hyoscine') followed by intermittent chloroform inhalations if needed. The pain relieving qualities of morphine are well known. Scopolamine appears to have the added property of blocking out memories of recent events. By the combination of these drugs in suitable dosage,

morphine dulled labour pains without materially interfering with the muscular contractions of labour, while scopolamine wiped out subsequent memories of the delivery room ordeal. The technique was widely used in Europe but soon fell into disrepute among obstetricians of this country, largely due to over dosage.

During the period of extensive use of 'twilight sleep' it was a common experience that women who were under the drug influence, were extremely candid and uninhibited in their statements. They often made remarks, which obviously would never have been uttered when in their normal state. Dr. Robert E. House, an observant physician practising in Ferris, Texas, believed that a drug combination which was so effective in the removal of ordinary restraints and which produced such utter candor, might be of value in obtaining factual information from persons who were thought to be lying.

Dr. House's first paper presented in 1922 suggested drug administration quite similar to the standard 'twilight sleep' procedure: an initial dose of < grain of morphine sulphate together with 1/100 grain of scopolamine hydrobromide, followed at 20-30 minute intervals with smaller (1/200 - 1/400 grain) doses of scopolamine and periods of light chloroform anaesthesia. Subjects were questioned as they recovered from the light chloroform anaesthesia and gave answers which subsequently proved to be true. Altogether, Dr. House reported about half-a-dozen cases, several of which were instrumental in securing the release of convicts from State prisons, he also observed that, after returning to their normal state, these subjects had little or no recollection of what had transpired during the period of interrogation. They could not remember what questions had been asked, nor by whom; neither could they recall any answers which they had made."

42. **The use of the 'Scopolamine' technique led to the coining of the expression 'truth serum'**. With the passage of time, injections of sodium amytal came to be used for inducing subjects to talk freely, primarily in the field of psychiatry. The author cited above has further observed, Id. at p. 522:

> *During World War II, this general technique of delving into a subject's inner consciousness through the instrumentality of narcotic drugs was widely used in the treatment of war neuroses (sometimes called `Battle shock' or 'shell shock'). Fighting men who had been through terrifically disturbing experiences often times developed symptoms of amnesia, mental withdrawal, negativity, paralyses, or many other mental, nervous, and physical derangements. In most instances, these patients refused to talk about the experiences which gave rise to the difficulty, and psychiatrists were at a loss to discover the crux of the problem. To intelligently counteract such a force, it was first necessary to identify it. Thus, the use of sedative drugs, first to analyze the source of disturbance (narco-analysis) and later to obtain the proper frame of mind in which the patient could and would 'talk out' his difficulties, and, as they say 'get them off his chest' – and thus relieve himself (narco-synthesis or narco-therapy) - was employed with signal success. In the Narco-analysis of war neuroses a very light narcosis is most desirable. With small doses of injectable barbiturates (sodium amytal or sodium pentothal) or with light inhalations of nitrous oxide or somnoform, the subject pours out his pent-up emotions without much prodding by the interrogator.*

43. It has been shown that the Central Investigation Agency (C.I.A.) in the U.S.A. had conducted research on the use of sodium pentothal for aiding interrogations in intelligence and counter-terrorism operations, as early as the 1950's [See 'Project MKULTRA – The CIA's program of research in behavioural modification', On file with Schaffer Library of Drug Policy, Text available from <www.druglibrary.org>]. In recent years, the debate over the use of 'truth-serums' has been revived with demands for their use on persons suspected of involvement in terrorist activities. Coming to the test procedure, when the drug (sodium pentothal) is administered intravenously, the subject ordinarily descends into anaesthesia in four stages, namely:

(i) Awake stage

(ii) Hypnotic stage

(iii) Sedative stage

(iv) Anaesthetic stage

44. A relatively lighter dose of sodium pentothal is injected to induce the 'hypnotic stage' and the questioning is conducted during the same. The hypnotic stage is maintained for the required period by controlling the rate of administration of the drug. As per the materials submitted before us, the behaviour exhibited by the subject during this stage has certain specific characteristics, namely:—

It facilitates the handling of negative emotional responses (*i.e.*, guilt, avoidance, aggression, frustration, non-responsiveness etc.) in a positive manner.

It helps in rapid exploration and identification of underlying conflicts in the subject's mind and unresolved feelings about past events.

It induces the subject to divulge information, which would usually not be revealed in conscious awareness and it is difficult for the person to lie at this stage. The reversal from this stage occurs immediately when the administration of the drug is discontinued.[14]

45. The personnel involved in conducting a 'narco-analysis' interview include:

1. a forensic psychologist,
2. an anaesthesiologist,
3. a psychiatrist,
4. a general physician or other medical staff and
5. a language interpreter if needed. Additionally,
6. a videographer is required to create video-recordings of the test for subsequent scrutiny.

In India, this technique has been administered either inside forensic science laboratories or in the operation theatres of recognised hospitals. While a psychiatrist and general physician perform the preliminary function of gauging whether the subject is mentally and physically fit to undergo the test, the anaesthesiologist supervises the intravenous administration of the drug. It is the forensic psychologist who actually conducts the questioning. Since the tests are meant to aid investigation efforts, the forensic psychologist needs to closely co-operate with the investigators in order to frame appropriate questions.

46. This technique can serve several ends. The revelations could help investigators to uncover vital evidence or to corroborate pre-existing testimonies and prosecution theories. Narco-analysis tests have also been used to detect 'malingering' (faking of amnesia). The premise is that during the 'hypnotic stage' the subject is unable to willfully suppress the memories associated with the relevant facts. Thus, it has been urged that drug-induced revelations can help to narrow down investigation efforts, thereby saving public resources. There is of course a very real possibility that information extracted through such interviews can lead to the uncovering of independent evidence which may be relevant. Hence, we must consider the implications of such derivative use of the drug-induced revelations, even if such revelations are not admissible as evidence. We must also account for the uses of this technique by persons other than investigators and prosecutors. Narco-analysis tests could be requested by defendants who want to prove their innocence. Demands for this test could also be made for purposes

14. "Laboratory Procedure Manual — Forensic Narco-Analysis," Directorate of Forensic Science, Ministry of Home Affairs, Government of India, New Delhi, 2005; Also see John M. Macdonald, "Truth Serum", 46(2) The Journal of Criminal Law, Criminology and Police Science, July-August 1955, pp 259-263.

such as gauging the credibility of testimony, to refresh the memory of witnesses or to ascertain the mental capacity of persons to stand trial.

Such uses can have a direct impact on the efficiency of investigations as well as the fairness of criminal trials. [*See* generally: George H. Dession, Lawrence Z. Freedman, Richard C. Donnelly and Frederick G. Redlich, 'Drug-Induced Revelation and Criminal Investigation', 62 Yale Law Journal 315-347 (February 1953)]

47. It is also important to be aware of the limitations of the 'narco-analysis' technique. It does not have an absolute success rate and there is always the possibility that the subject will not reveal any relevant information. Some studies have shown that most of the drug-induced revelations are not related to the relevant facts and they are more likely to be in the nature of inconsequential information about the subjects' personal lives. It takes great skill on part of the interrogators to extract and identify information which could eventually prove to be useful. While some persons are able to retain their ability to deceive even in the hypnotic state, others can become extremely suggestible to questioning. This is especially worrying, since investigators who are under pressure to deliver results could frame questions in a manner that prompts incriminatory responses. Subjects could also concoct fanciful stories in the course of the 'hypnotic stage'. Since the responses of different individuals are bound to vary, there is no uniform criteria for evaluating the efficacy of the 'narco-analysis' technique.

CHAPTER 33

CRIMINAL PROFILING IN FORENSICS[1]

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33.1 GENERAL

Profiling

"Most efficacious in cases where an unknown perpetrator has displayed indications of psycho-pathology"

Holmes and Homes, 1994

Urbanisation in India is spreading like a wild fire. It has created many law and order problems. Among the important ones are the anonymity and the hiding facilities the cities are offering to the criminal. A criminal can commit a crime and roam about in the city with impunity. The case of Raghav Raman of Mumbai is a revelation!

Raman Raghav was a serial killer who operated in the suburbs of Mumbai in the sixties of the last century. He killed at least 35 persons with an iron rod, bent at right angle and sharpened

1. The discussions in this chapter mainly centre on serial murderers and sex murderers of all types.

at the shorter end. He would give just one blow at the temple. There was hardly any person who survived after his attack.

*His victims were poor people from slum area and pavement sleepers. He would attack them around 1 AM. He did not know any of them. Revenge, sex or money was not his motives. He killed them because '**God ordered him**' to do so as per his statement. He was a true psychopath serial killer.*

The police did get a profile of the criminal but it was of limited use. (CH)

In such cases, however, profiling of an unknown criminal provides significant help. An experienced profiler can draw a reasonably good profile that can help in the identification/apprehension of the culprit, the psychopathic killer or other criminals.

They provide many idiosyncrasies in the execution of their nefarious task, which constitutes thumbprints of their *modus operandi*, which lead the law enforcement agencies to them. A profile does not identify the culprit. It only describes his personality traits, which reduced the field of search and investigation. Definite identification is based on physical evidence like DNA, fingerprints, or other clue clues, which the culprit exchanges with the victim, the scene (and articles thereon), the weapon of offence or transport used.

Profiles of the criminals provide multi-purpose help to indicate the criminals:

- Assess the motive of the criminal,
- Indicate particular types of physical evidence at the scene, which help to link the criminal to the crime, and
- Suggest interrogation mode.

Criminal profiling is useful in a variety of cases where an unknown criminal is involved and who is not easily traceable, including the following types:

1. Sex murders including sadistic murders where the body is mutilated.
2. Serial killings.
3. Racist killings.
4. God-ordained or **"visionary"** killings.
5. "Missionary" killings.
6. Ritualistic murders.
7. Schizophrenic killings; here the culprit "pre-empts" the assaults of an imaginary foe.
8. Organ theft cases.
9. Corpse mutilation cases.
10. Cannibalism cases.
11. Some arson cases.
12. Paedophilic cases.

33.2 NATURE

Criminal profiling is also known as psychological profiling, offender profiling, behavioural profiling, criminal personality profiling or criminological profiling. FBI has named it as a Criminal Investigative Analysis (CIA).

Criminal profiling is an investigative tool used by the investigating agencies to identify likely suspects and to analyse patterns to predict the offender's future offences and victims (predictive profiling).

Criminal profiling process uses the action and behaviour of the criminal (or in their omission) at the crime scene; to profile his mental, emotional, physical and other personality characteristics in the commission of the crime. The FBI has created a Behaviour Assessment Unit. It helps to analyse the collected data to guide investigations by interpreting the offender's behaviour during the crime and the interactions between the offender and the victim during the commission of the crime as displayed in the crime scene.

Criminal profiling means to create a word picture (with or without a sketch) of an unknown criminal whose antecedents are not known nor are they easily available. This developed criminal profile helps the investigators to reduce the area of search and the number of possible suspects for locating the unknown criminal and to indicate his identifying personality features. The profile does not claim to pinpoint the identity of the criminal though it may indicate the socio-geographic background, health status, mental aberrations and his lifestyle.

Current applications of criminal profiling in criminal cases mainly include predictive profiling, sexual assault offender profiling, and case linkage.

Criminal profiling is based upon his behaviour, actions and utterances in a given situation, his actions at the crime scene(s) his treatment of the victim, his language/dialect and his utterances, including use of slangs and expletives at the time of the incident. Criminal Profiling also takes into consideration his choice of the scene, handling of the scene, the *modus operandi* he has adopted, his arrival and departure (time, mode and route) from the scene, his disposal of the victim or the available evidence, which reflect upon his personality: behaviour, thoughts and actions. The profiler may also predict his future activities and guesses the past misdeeds he had done.

Profiling is also used in civil situations. The mode and motives may be different. They were and are used in varied tasks including some of the following nature:

1. Military Selection Boards in India have been employing specialists to profile the candidates appearing for the selection of officers' rank for decades to ascertain their suitability for military service.
2. Some Bank Staff Selection Boards have been procuring profiles of job seekers mainly from the honesty, devotion to duty and loyalty angles.
3. Business tycoons, entering into a partnership, get profiles of their would-be partners.
4. In the selection of spouse, some persons get profiles of the would-be life-partners before marriages.

The methods of profiling and the intensity of inputs in civil profiling vary tremendously. In fact, most of the profilers follow their own techniques. However, the FBI has put in tremendous effort and has come up with a profiling system which is being adopted by most of the specialists in the USA, with minor variations, if any.

Induction of profiling to locate criminals has boosted the use of profiling. Rather, criminal's profiling has taken the centre stage in the field. The TV has promoted its popularity. But it must not be forgotten that profiling is only a help to identify. Further, it is applicable only to a certain type of crimes where a psychopath is on the rampage. Serial killings and sex murders are its main targets; motiveless arson and visionary and missionary murders also fall in its ambit.

Criminal profiling involves large work force and considerable funding.

33.3 THE CRIMINAL

Who is a criminal whose profile is needed in a criminal investigation? Naturally, he is usually an unknown entity who has committed a serious crime. He may or may not be a recidivist.

Usually, he is a recidivist (repeats the same type of heinous crime time and again). He is involved in heinous crimes like murders, sexual offences including sex murders, ritual murders, sadistic and hedonistic (perverse pleasure) murders. In hedonistic murders, the killer is mentally perverse. He enjoys pain, shock and death in others. Some of them enjoy blazing fires and indulge in arson.

The criminal profiling subjects are usually mentally abnormal. They may be schizophrenic, sex maniac (hyper-sexed person), psychotic, psychopathic and pyromaniacs. The mental abnormality may be inborn, acquired or social maltreatment may have thrust it upon him. A drug addict or an alcoholic may acquire the abnormality through abuse of drugs or drunkenness. An excessively maltreated person in childhood or adolescence may lose mental balance and may like to settle scores with the society as a whole. He loses a sense of human feeling or decency. He takes pleasure in vindictive anti-social acts and goes on committing them until he is controlled (arrested and imprisoned). The general name given to such mental imbalance is Psycho-Pathetic Disorders.

What is the motive of a psychopath to commit the crime? The traditional crime movers: Zun, Zamin and Zar [Female (sex), property and money] are there and will remain there; but they do not account for all the criminals under the scan. Some psychopaths are "ordained" by the almighty; or, so they believe! There are **"visionary**" who see visions that spur them to kill certain persons. They kill. Random killers and Sect killers fall in the category. Prostitute killers are self-appointed scavengers to clean the area from the prostitute, whore harbinger of sex spread diseases and other social evils. Racists, like Nazis, are "missionaries" oriented to make the world free from some community. Impulse stirs other criminals to abnormal behaviour. Emotional tyranny may end in anger, fear, compassion, depression and cause abnormal behaviour. The ego of the culprit may need self-certification of power and sex drive. Revenge for real or imaginary ills against individuals or a class of individuals may again be a dominant motive.

Hedonist (thrill seekers) and sex maniac form perhaps the majority of the culprit subjects for criminal profiling on whom serious profilers work to create their profiles.

The factors, which promote criminality, are inborn biology, disturbed family life, criminal environment, lack of proper education and abject financial and social constraints in life. *Jhungi Jhaunpari* (Ghettos) dwellers often fall prey to become such criminals.

33.3.1 Criminal's General Portrait

The criminals who commit heinous crimes and are recidivist (repeaters) haves two main personality traits: the general traits and the crime-specific traits.

The general criminal traits of the criminal are:

1. He has no remorse or regrets for the heinous acts of crime, he commits.
2. He does not stick to any profession.
3. He is slip-shod in his actions.
4. He has no respect for the law, social norms or social behaviour. He breaks them **repeatedly** with impunity, for his gains or to satisfy his unholy desire for lust or sadistic pleasure. He is law unto himself.
5. He is a liar, a cheat and a con artist.
6. He is selfish.
7. He is impulsive. Takes the decision at the spur of the moment without prior consideration or planning.

8. He is easily irritated and picks up fights with one and all, without any regard to his or opponents safety.

There are two types of criminals under the scan: those who carry out their nefarious trade meticulously (organised); those who carry out their criminal activity haphazardly. They are disorganized criminals. The two types leave different types of evidential trails in their commission of crime.

33.4 PROFILER

33.4.1 The Profiler

Profiler is a person who creates criminal personality profile of a criminal from his action, utterances, writings, behaviour towards the victim, his *modus operandi*, his action at the scene, choice of the site and the time. The created profile can provide answers to many questions, including the following questions about the crime and the criminal, with varying degrees of certainty:

1. Who is the criminal?
2. Which is his residential area?
3. What is his dialect?
4. What are his body characteristics (body built)?
5. What are his psychopathic traits?
6. Is he an organised or disorganized person?
7. What is his social status?
8. What is his educational standard?
9. What was his motive to commit the crime?
10. What is the Hallmark (distinguishing feature) of his criminal acts?
11. What type of victim does he choose?
12. What type of site does he choose for the crime?
13. At what time does he strike?
14. When and where will the criminal strike again?
15. What is his IQ?

33.4.2 Qualifications

The profiler is a new entity. He ties the loose ends of the different types of data, applying logic, psychology, knowledge, crime data relating to the case in hand and of similar other crimes. He thus creates a physical, mental, and emotional profile of the likely criminal.

The main qualifications of the profiler are:

1. A master's degree in criminal psychology; preferably a Ph. D. degree.[2]
2. Training in profiling.
3. Attachment with a seasoned profiler for a considerable time.

These qualifications are indispensable. In addition, the profiler should have a highly developed sense of rationalisation, a deep understanding of the crimes, criminals and criminology.

2. Gives him confidence (Research methodology!) and laces him with better respectability.

The profiler creates profiles independently, only after he has acquired considerable experience of working with a seasoned profiler. Then and then only, he will be able to meet the challenges of correct profiling of the criminal.

Basic education in psychology or criminology is a good starting point. Augmentation of the skill through training is a must. Attachment experience is indispensable. However, to be a top bloke in the profession, the person must have a keen interest and a deep sense of honesty, dedications to the science and devotion to the work and profession. He must be a man of science. He goes only by the dictates of data, observes the laid down norms, shuns hunches, intuition or dictates of superiors. He knows the negative power of Conformation Syndrome and avoids it. He does not hesitate to consult a fellow specialist(s) in refractory cases. Above all, he keeps up with the Joneses in the profession.

33.4.3 State of the Art

The need for correct criminal profiling is immense in modern society where anonymity is the rule, and it is increasing. But there are few profilers in India. The number must go up. It is hoped that the situation will improve in the coming times.

33.5 CRIMINAL PROFILING PROCESS

33.5.1 Criminal's Profile

Criminal profiling is both an art and science. It involves the contribution of a number of professionals for collecting the basic data on which the profile is based. An ideal profile of a criminal consists of many elements including the following:

1. Age, sex, and body built of the criminal,
2. Educational standards of the subject,
3. Language or dialect from his utterance; dialect may indicate the area of origin,
4. Possible vocation, if any
5. Addiction, if any
6. Behaviour including mannerism in handling the victim,
7. Social background,
8. *Modus operandi*,
9. Choice of victims,
10. Enticement mode,
11. Transport used,
12. Choice of site(s) for the criminal act, modes of ingress and egress,
13. Manner of disposal of the victim,
14. Efforts to keep the act secret, and
15. Periodicity of such occurrences.

It is rare that a profiler gets all the data to give information on all the above elements of the profile. However, he tries to get data on as many of the elements as he can and provides a workable profile.

33.5.2 Aims of Profiling

Profiling has, in brief, intends to:

1. Fix identity of an unknown criminal through profiling.
2. Assess the type of victim-culprit syndrome and prevent recurrence of similar crime by the same criminal.
3. Recognise the field of operation of the subject; and guard the area and apprehend the criminal red-handed when he strikes again.
4. Provide *"portrait parle"* (sex, age, race, marital status, and employment status) of the criminal to help his arrest and to pre-empt occurrence of similar incidence.
5. Provide guidelines about the nature of scene of crime and the expected evidence thereon.
6. Indicate the likely social group and residential area of the criminal.
7. Create a psychological portrait of the subject.
8. Furnish guidelines for interrogation.
9. Give additional information on any of the elements of Profile.

The scope of criminal profiles is expanding. It is possible that profiling may be used to know the unknown criminal in less heinous crime also; once the stage for profiling is set at a reasonable expense of time and money.

33.6 DATA FOR PROFILING

> **"It is a capital mistake to theorise before one has the data"**
>
> **Sherlock Holmes**

Profiling is a complex task of collecting relevant data, evaluating and fixing it in the jigsaw puzzle to frame a profile. The data collection is the basic task. If it is insufficient, incorrect or wrong, the efforts of the profiler will be futile; the created profile will mislead. Data collection needs a lot of time and effort and hence it is costly and time-consuming.

A worthwhile profile of a criminal needs a lot of information. A profiler alone cannot and does not gather all the needed information. The assistance and joint efforts of many persons create the needed synergic effect.

The following main sources provide the needed data:

1. The victim;
2. The crime scene;
3. The utterances of the culprit;
4. The culprit's treatment of the victim before/after death;
5. The medico-legal or post-mortem report;
6. The written communication of the culprit, if any; and
7. The pattern of criminal's actions—*modus operandi*.

33.6.1 Victim

The victim is an important source of evidence. Live victims provide information and data about the criminal. The profiler gets the details from the live victims through interrogations and interviews. He can understand the culprit (and the victim) better and can get clarifications he may need at times about the details of the occurrence, the *modus operandi* and the part played by the victim in resisting the onslaught; from which an accurate profile is built.

The victim may be incoherent due to shock or fear. The profiler may have to use special techniques (hypnosis) to extract the correct and complete details.

However, in most of the cases, the victim is dead.

The dead also furnishes important and substantial data if a competent and experienced medico-legal expert examines the dead. All should join hands to get the maximum information.

The evidence obtained from the victim about the culprit is:

1. Antecedent evidence Physical description,
2. Physical action,
3. Culprit's utterance,
4. Drunk or under the influence of drug(s),
5. Post crime action,
6. Transport used.

33.6.1.1 Antecedent Evidence

It is possible only if the victim is alive and knows the culprit. It is almost non-existent. The knowledge helps the profiler.

The antecedent evidence about the victim is usually known. It is obtained from his or her family, friends, acquaintances, neighbours, office colleagues and co-workers. The persons who had business dealings or household staff are also useful sources to know about the personality of the victim. The information plays an important part in profiling the offender. It can answer the main question of the profiler:

"Why was this victim selected by the culprit?"

In addition, the knowledge of the antecedents of the victim helps the profiler to develop a clear picture of victim's:

- Physical health
- Working schedule
- Physical features
- Emotional personality
- Psychological personality
- Promiscuous?
- Addicted?
- Alcoholic?
- Living style, habits, including office or household routine?
- Risk involved for both the victim and the culprit. Risk factors often determine not only the crime scene site but also the *modus operandi* of the crime and the extent and pattern of injuries. They may also necessitate advance planning.

The profiler takes these aspects in building the profile of the offender along with the *modus operandi*, the planning and the skill of the culprit in the execution of his task.

33.6.1.2 Evidence on Victim

The evidence on the person of the victim and apparel thereon help to build up the profile of the offender.

The evidentiary clues blood, semen, saliva, skin, flesh, hair, bite marks, (DNA!), fibres, bullets, their marks, injuries and wounds provide the clinching linkage and identity of the culprit in many a case where the offender is apprehended.

A medico-legal expert provides the evidence available on the person of the victim. He answers to the many questions[3]:

The clothes on the victim also provide evidence for profiling and identification of the culprit. Provocative apparel, tears and stains on them and the extent of exposure of the corpse are significant to indicate the events which took place at the time of assault; or, before or after the assault.

33.6.1.3 Oral Evidence

If the victim survives the attack of the culprit, she or he will be the most important information source about meeting, luring, mode of transport, the language he used the places to which he took and the all the violent or non-violent acts he performed against the victim. The wealth of information facilitates the work of the profiler to build up a profile of the criminal. The profiler must interview the victim at the earliest to get all the useful details.

The victim can also narrate the utterances of the culprit which are useful to the profiler to indicate the area from which the culprit hails, educational standard and societal standing.

Live victims are sometimes so frightened or shocked that they are unable to assist the investigations through direct interviews. Other methods of interrogations have to be tried. Hypnosis has proved effective in some cases.

33.6.1.4 Offender's action profile

The action profile of the culprit *vis-a-vis* the victim is the primary source of information, which not only helps to peep into the mind of the culprit but also provide linkage between similar crimes *via* the injury patterns.

The semen, blood, skin and flesh on the person of the victim may provide clues which provide definite identification of the culprit.

The following evidence needs careful consideration:

- The utterances (language, accent, slangs, per words abuses) of the culprit
- The culprit's treatment of the victim before/after death
- Written communication of the culprit, if any
- The pattern of criminal's actions—his *modus operandi*.

3. *Supra.*

33.6.1.5 The Medico-legal Expert

The Medico-legal Expert is an important source of information in profiling the culprit. In addition to indicating the nature and cause of death, the weapon used and the number of injuries, their fatal or non-fatal nature and their sites. he provides answers to questions:

- Why so many injuries? Were they needed to kill?
- Pattern (sequence) of injuries?
- Cause: sadistic pleasure?
- Victim's resistance?
- Mental imbalance?
- Infuriated?
- Cannibalistic action?
- Body part taken as souvenir?
- Necrophilia act performed?
- Knowledge of Anatomy?
- Surgical (or butcher's) skill?
- Serial killer; recidivist [similar case(s) examined before]?
- Correspondence with other case(s) examined before?
- Body naked? How were the clothes taken off?
- Clothes torn? Pattern?

33.7 THE INVESTIGATOR

The investigator is the main actor in the process of gathering evidence for criminal profiling. He does all the legwork, so much needed in the process of the collection of evidence. His main activities in the process include the following:

1. **Handles the multi-site scenes:** records them video graphically, photographically, by sketching and by textual description; notes oddities at the scene and collects physical clues including, prints, impressions, odours and objects.
2. **Interrogates (Interviews) the victim:** (if alive); witnesses and suspect(s) at the earliest so that the interviewee does not forget the details, does not rationalise, does not add hearsay evidence or gets biased for one or more of the numerous reasons.
3. **Gets the victim examined:** from an experienced medico-legal expert.
4. **Utilises the services of/profiler/forensic psychologist/forensic psychiatrist**: in India, it is a big problem. We have hardly any seasoned profilers, forensic psychologists or Forensic psychiatrists though you might get quite a few charlatans. In the USA, on the other hand, some police department has them on their roll or they have them on-call basis (contract basis!).
5. **Collects and puts all the evidence before the profiler**:

   It includes:

   - all documentation of the scene (including video film, photographs, sketches and description script),

- **statements of the witnesses** and the victim and the findings of the background information of victim,
- details of other similar cases whether they are geographically relevant or irrelevant, and
- his own assessment about certain person(s) with reasons for linking them with the crime.

6. **Provides any additional help:** or information the profiler may require.

The major tasks of the investigating officer are:

- Gathering circumstantial Evidence
- Examination of Scene of occurrence
- Crime Scene
- Collection of intelligence

33.7.1 Circumstantial Evidence

The investigator has to do a lot of legwork to find out the evidence surrounding the incident. He tries to:

- Establish the site of the main occurrence and its geographical feature if it is an outdoor site and whether it is frequented or a deserted place?
- Ascertain if the contact/enticement/assault was pre-planned.
- Fix the timeframe: contact time with the victim/enticing time/assault time.
- Identify the possible culprit as relative/intimate mate[4]/acquaintance/colleague/stranger.
- Guess/ascertain the motive.
- Compare the incident pattern with other similar occurrences.

33.7.2 Crime Scene[5]

Crime scene possesses a wealth of information which goes a long way to a create a criminals profile. Usually, the crimes under the scan are multi-scene crimes. They involve occurrence site(s), hiding site, disposal site and carriage vehicle**.** These are the places where the culprit and the victim meet each other also come in contact with the crime scenes and the objects thereon. The contacts exchange traces mutually.[6] These exchanged trances and the disturbances and disorders provide a wealth of information useful for criminal profiling. However, the crime scene must be processed professionally and without delay.

Police investigator handles the scene but in important cases, the following professionals assist them:

1. Forensic Expert
2. Medico-legal Expert
3. Imaging Expert

The tasks these experts perform are well-known and need not be repeated. The chief police investigator remains the chief of the team.

For the systematic handling of the scene, the investigating officer has to:

4. Living-in couples are coming up in Indian cities.
5. For detailed handling of the crime scene, see Chapter 5 "Scene of Occurrence".
6. Locard's Law of Exchange!

1. Barricade the scene.
2. Put a guard on the scene to prevent unauthorised entry to the scene.
3. Walk through the scene to assess the need of the scene and requisition the needed help.
4. Record (with the assistance of imaging expert) the scene through:
   - Video film
   - Digital photography
   - Sketches
   - Textual description

   Proper documentation of crime scene is mandatory. Videography preserves the scene indefinitely. Thus, check and recheck are possible. The scene can be taken to the courts even after years!
5. Locate and fixes the positions of evidentiary clue photographically and through sketches.
6. Collect packs and dispatches the evidence to the concerned quarters with appropriate queries.

   In all the processes he ensures that the identity (*vis-à-vis* the case), integrity (no contamination no mutilation, no obliteration, no destruction), and continuity of the chain of possession (through possession log) is maintained.
7. Prepare a crime scene report.

The evidence at the scene is varied. It may be odour(s) or scents, prints and impressions, marks, objects [evidentiary clues including corpse(s)] or even the disturbance and disorder pattern. All are properly recorded, collected and got evaluated. They all help in criminal profiling. For example:

1. The size of the foot/footwear marks indicate the height and built of the culprit.
2. Tyre marks indicate the type of vehicle used. The tyre marks may also indicate the routes taken by the culprit to reach and leave the crime scene. The vehicle, indirectly, indicates the lifestyle of the culprit.
3. The blood spatters may indicate a fight or attempt at getting away.
4. The broken and or overturned furniture may indicate self-defence.
5. Blood, saliva and semen, through DNA, link or de-link a suspect with the crime.
6. Left-over object like purse, keys, and handkerchiefs can indicate the personality/identity of the culprit.
7. Hair left at the scene may indicate the ancestry and the identity of the culprit through DNA.
8. Traces like the smell of putrefaction of flesh, blood, body parts even maggot may indicate the hiding place of the body and the duration for which it has been kept.
9. Traces of narcotic drugs or their packing material may indicate that the culprit (or the victim) is/was drug abuser/addict.

The importance of proper evaluation of the crime scene can never be over-emphasised.

33.7.3 Collection of Intelligence

The local police also develop intelligence system in their own area. The police head gets information periodically (daily in some jurisdictions) about new visitors, incidents and of trouble spots. If the culprit is a newcomer, the local informer may be in a position to give a working portrait of the individual.

Information about the criminal, the victim and about the situational environment is highly beneficial in building the criminal profile. The collection of the intelligence thereof is an important aspect of the investigation of blind murders or rape-murders. Sources of information other than the police informers are:

1. Neighbours
2. Panwaries (who sell pan and cigarettes)
3. Chowkidars (guards)
4. Chance witnesses

The information from these sources can guide the investigation about the possible culprit, about the character and lifestyle of the victim and her or his contribution towards the crime thereof, motive and sometimes the time element and mode of the occurrence.

33.8 CASE HISTORIES

Sex murders and serial murders were not very frequent in India. However, they are increasing with speed. During the first decade of the 21st century, the rape cases increased by fifty %!

33.8.1 Nirbhaya case[7]

> *The latest case in Delhi is an example of extreme brutality! An educated woman was waiting for a bus at one of the bus stands along with her educated friend. A private bus came and offered a lift. Both the persons boarded the bus as they were getting late.*
>
> *It was about 9.30 pm. The bus had curtains drawn on the windows. There were 6 persons (friends?) in the bus drinking and making merry. Soon after they caught hold of the persons beat the man and raped the girl. She resisted the rape. So she was brutally attacked and injured. After satisfying their lust, they threw the two on the road side. They were picked up by a passerby and taken to a hospital. The man survived the injuries but the girl in spite of the best medical aid succumbed to them after fighting the odds for about a week.*
>
> *The doctors who attended upon the girl, remarked that they have never seen such a brutal attack in sexual assault.[8] (CH)*

The investigators and especially the profilers must study these cases in-depth whether they have been successfully investigated or are still pending apprehension of the culprit. The study is highly rewarding. In rare cases, it may link the case in hand with another case(s). That, of course, will be a great find. But otherwise also the case studies are highly useful to understand the criminal mind, the varied motives and, more importantly, the varied *modus operandi* used to commit the heinous crimes under the scan.

Data of similar cases from far and wide in time (decades) and space (whole country) should be collected.

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7. There were six criminals of the brutal murder-rape case. One committed suicide during the trial, one was juvenile and sentenced per the prevailing law. The remaining four were sentenced to death by the trial court, confirmed by the high court. The Supreme Court maintained the death sentence.[2017 *Mukesh v State for NCT of Delhi,* Criminal Appeal Nos. 607–08 of 2017, SC, Decided on 5 May 2017. Bench: Dipak Misra, R. Banumathi, Ashok Bhushan].
8. Five persons were prosecuted. The sessions court sentenced four of them to death and the fifth who was a juvenile, was sent to juvenile home in September 2013.

33.8.2 TV Serials and Films

In every country, there are TV serials or films on serial murders and sex crimes. Their CDs should form part of the profiler's library. In fact, these serials and films often excite the evil mind. They might have adopted (or may adopt in future) the ideas and the modes exhibited therein to commit such heinous crimes.

33.9 PROFILING PROCESS

33.9.1 Assumptions

The profiling process, under discussion, relates mainly to serial murders, sex and sadistic murders, visionary and missionary murders. The process presumes the following assumptions:

1. The culprit is male. The process, however, is also applicable to the female criminal.
2. The profiler is a well-qualified and experienced professional.[9]
3. The profiler is provided with all the relevant, correct and reliable data from the crime scene by a seasoned, experienced and dedicated investigator (or a dedicated investigating team!) for such work. The data include complete documentation (video film(s), photographs, sketches, script description, statement of witnesses and investigator's report). He is informed about the idiosyncrasies of the crime scene, if, any, while submitting the data.
4. A senior medico-legal expert, preferably with a team, collects the evidence from the person of the victim including the clothes. He gives all the important details: the number of injuries, their sequence, fatal or non-fatal injuries, superfluous injuries and sadistic injuries. He documents any extraneous material(s) found on the victim and recovered. The types of weapon used the force with which the injuries were inflicted. are also described. The expert should be available to the profiler for conference so that he can get odds and ends cleared from the medico-legal expert if he so needs.
5. The intelligence about the strangers and vagabonds in the area is trustworthy, collected by reliable and experienced sources.
6. The culprit reflects his personality in the various acts of omissions and commissions in enticing the victim, his activities at the crime scene or while he was with the victim before and after the crime.
7. Behaviour of the offender is consistent in the series of crimes he commits. Thus, use of linkage analysis is valid to inter-link similar cases and link them to one offender because of the similarities that are present.

33.9.2 Process

Profiling is a multipoint process:

Firstly, the profiler acquires the data about the crime, the crime scene, *modus operandi,* behaviour towards the victim, idiosyncrasies, disposal mode of the body or bodies and his post-action behaviour. Or, he has to contend with the data which the investigator(s) and others have been able to scrabble to build up the possible (perfunctory, partial or complete) profile.

Secondly, the profiler assesses the crime and the criminal:

1) Isolated case

9. *Supra*, p 1394.

2) Serial murder
3) Sex murder/crime
4) Sadistic murder
5) Ritual, missionary or visionary murder
6) Murderer's typology. Psychopath or mentally deficient. Organised or disorganised. Educated, semi-literate or illiterate?
7) Drug addict?
8) Alcoholic?

Evidence is searched for motive and risks for the culprit and the victim, personality traits and the time element of the various steps involved in the crime and time interval and the areas in the serial crimes.

Thirdly, the profiler fixes the jigsaw puzzle of the profile by taking over mentally the role of the victim as well as that of the culprit and evaluates the possible actions and reactions of the culprit and the victim for the emergence of the evidence found at the scene and on the victim. He especially notes what the abnormal features are in the act of crime and what the offender's individualistic idiosyncrasies are, which may form the crime thumbprint of the criminal *vis-à-vis* the crimes. If all the important pieces of evidence do not fit in the profile structure, the structure is abandoned and another profile structure is envisaged and tried. The process goes on ununtil the profiler believes that he has hit the right structure in which the incidents of the crime fit in.

The experience of the profiler in other cases and that study of other profiler's reports/ investigations go a long way for correct assessment/prediction about the culprit.

What are the contents of an ideal criminal profile?

The profiler uses both inductive and deductive logic to extract culprit's features, working habits, lifestyle, geographical location, vocation, and behaviour from the evidence and come up with a profile which explains the various events of the crime.

The modes of evaluations and deductions of the profilers vary from one specialist to another. All the processes are highly complex and beyond the scope of the present discussions. However, every profiler usually concentrates on the following aspects:

1. Stature: height, built, the footprints, the gait pattern and other clues help in estimating the stature.
2. Age, sex, ancestry.
3. Appearance.
4. Relationship with the victim.
5. Educational standard.
6. Language (including vocabulary and slangs) used at the scene or in the note(s) sent to police or others.
7. Vocation, if any.
8. Addiction, if any.
9. Behaviour including mannerism in handling the victim.
10. Social background.
11. Area of origin, residential area(s) and places frequented.

12. *Modus operandi.*
13. Choice of victims.
14. Enticement mode.
15. Transport used.
16. Choice of the site(s) for the criminal act, modes of ingress and egress, disposal of the body.
17. Manner of disposal of the victim.
18. Efforts to keep the act secret.
19. Indications of cannibalism if any.
20. Taking body parts as souvenirs.
21. Periodicity of the occurrences.

The volume of information and its correctness in the profile largely depends upon the culprit's actions: how unique they are, how much evidence he left and to what extent the left over evidence is amenable to interpretation for profiling. Culprits in all cases cannot be profiled. The profiles also vary in their contribution towards identity indication. A few may be at the target, the other may be half-truths and still others may not only miss the bus but may mislead the investigations. Criminal profiling therefore is yet to receive proper respectability. But it is an important assistance to the investigator and is gaining more and more reliability and hence importance. The scientists, therefore, have to improve their tools and techniques so that it becomes a more useful weapon in the armoury of the crime investigators.

33.9.3 Profiling Modes

Every profiler has his own methodology for profiling, as seen earlier. But the profiling process has also to vary according to the nature of the crime and the available evidence at the scene, with the victim and other sources.

In general, three modes: FBI mode, Canter Mode, and Turvey mode are being used in criminal profiling.

33.9.3.1 FBI Mode[10]

FBI has made the criminal profiling (also called criminal analysis) into a six step process:

1. **Profiling Inputs:** In this step the total available information from all sources is collected and submitted to the profiler. He evaluates the evidence and compares the same with the evidence available in similar cases.
2. **Decision Process Models:** In this step the profiler tries various hypothetical models and tries to co-relate the evidence with each model.
3. **Crime Assessment:** The crime in hand is then assessed *vis-à-vis* the model presented by the profiler to assess whether the details of the crime fit with the likely behaviour of the criminal.
4. **Criminal Profile:** Finally the given profile is accepted (or rejected, and a new profile is prepared). The details of the model are then furnished to the investigators, giving some reasons on some details.

10. F.B.I. Mode (VI-CAP- CSA).

5. **Investigation:** The profile is then circulated among all concerned including public in some cases. The persons with similar profiles are located, profiles compared and those persons with whom it comes closest are investigated covertly or overtly.
6. **Apprehension:** Once the match is found and some evidence against the person is secured, the suspect is apprehended: to extract clinching evidence to link or delink him with the crime case in hand.

33.9.3.2 Canter's Statistical Mode[11]

Canter' a candid approach is based upon statistical data compiled from the records of the criminals from various sources including court records, police records, prison records and hospital records. The data is classified according to various parameters to type the criminal. The following important parameters are included in typing the criminal and to build his profile:

1. Typology of the criminal
2. Type of the crime
3. Motive for the crime
4. Behaviour at the crime scene
5. General behaviour of the criminal
6. Time and place of commission of the crime
7. Treatment of the victim

Canter utilised a large amount of data to segregate the criminals into several groups and went on adding new data from new cases. He would, then match the data of the given unknown criminal and would create the profile of the unknown criminal.

33.9.3.3 Turvey's Behaviour Evidence Analysis[12]

Turvey was of the firm belief that, for profiling, scientific evidence must be utilised to get worthwhile results. His Behaviour Evidence Analysis technique involved three elements: Forensic evaluation of the evidentiary clues and their correct interpretation; the study (profiling) of the victim and thorough inspection of the scene and gathering all the evidence available thereon to collect data on the following points:

1. **Evidence evaluation:** The incident involves a lot of evidence exchanged by the participants. The total evidence (material clues, disturbance, scents, odours, photographs, video graphs, sketches, marks, patterns) all tell a story. They must be evaluated in proper crime related perspective.
2. **Disposal site:** The site of the disposal of the victim and other articles involved in the crime provides a lot of information in profiling.
3. **The witness:** The witnesses at or around the crime scene or passers-by may have observed, seen or heard things some of which may be helpful to create a viable criminal profile. They need careful consideration.
4. **Post-mortem examination:** The autopsy (or injury report in case the victim is not dead) speaks volumes of the mind of the killer and provide a lot of information for

11. Canter, D. 1995, *Criminal Shadows*; Harper Collins, London.
12. Turvey, BE, *Criminal Profiling*, Academic Press, London, 1999.

compiling the criminal's profile. The post-mortem examination must be done by a competent expert and in its entirety to get its full value for evaluation.

5. **Victimology:** The main addition to the usual aspect of profiling is Turvey's stress on careful study of the victim, his actions and behaviour to find out:
   - What was the background (age, health, sex, residence, profession, lifestyle, circle of friends (and enemies) and business partners) of the victim?
   - Why was the person chosen?
   - Where and how was the victim picked up, carried, killed and disposed off?
   - Was the victim known (or unknown) to the culprit?

A complete profile of the victim is highly useful. It should be as complete as that of the criminal. It is easier to build the same whether the victim is living or dead.

In addition to the above, there are other techniques of profiling being practised. In fact most of the profilers use their own modes, though they may be similar to any of the above three. In fact they are variations of the same most of the time.

33.9.4 Recent developments in processing

There are many new approaches towards profiling, including the following:

1. **The 3-pronged approach:** it utilises the criminal investigative approach, the clinical practitioner approach, and the scientific statistical approach singly or severally.
2. **The 5-steps approach**: it analyses the criminal act and compare it to similar crimes in the past, carries out in-depth analysis of the actual crime scene, assesses the victim's background and activities for possible motives and connections, considers other possible motives and finally develops a profile of the possible offender. The five assessments are:
   - obtaining data from all sources,
   - evaluating the data and identifying significant features of each crime in the series,
   - classifying the significant features as either modus operandi or ritualistic,
   - comparing the combination of modus operandi and ritual or fantasy-based features across the series to determine if a signature of the suspect exists,
   - The last step is to write a concise, precise and intelligible report.
3. **FBI BAU UNIT**: it uses a 6-stage process to develop a criminal profile: profiling inputs, decision process models, crime assessment, criminal profiling, investigation, and apprehension.

33.10 SOME PROFILES

33.10.1 Jack the Ripper

"Jack the Ripper" operated in the south east part of London in 1880s. He raped and killed at least a dozen women in that part of the city. He simultaneously challenged the police to catch him. The police tried but could not lay hands upon him. Ultimately, they utilised the profile created by Dr. Thomas Bond who was a police surgeon. His profile of Jack the killer indicated:

1. Only one person was responsible for at least five out of the seven murders in which he had carried out the post-mortems of the victims.

2. The killings were sex murders, involving sadistic behaviour.
3. The culprit was a strong, composed and daring loner
4. He was probably hypersexual.
5. The culprit had no anatomical knowledge. Hence, he could not be a doctor or a butcher.
6. His outwardly appearance: quiet, innocent look; middle-aged person; neatly attired wearing a cloak probably
7. No fixed occupation

A person was arrested on the basis of the profile and convicted. Some people cried foul that the accused was not the real Jack the Ripper[13]. (CH)

33.10.2 Adolf Hitler

Adolf Hitler, who was a dictator in Germany, was responsible for World War II. In 1943, the US Strategic Service Unit decided to get a behavioural and psychological profile of Hitler. Dr. WC Langer, a psychoanalyst, was commissioned to do the needful.

Dr. Langer studied the utterances and writings of the dictator and also interviewed people who knew the dictator and prepared the profile and gave it to the authorities. The findings in the profile have since been published[14] in the form of a book.

The main features of the profile are:

1. Hitler was meticulous about his dress and appearance.
2. He was healthy and unlikely to die natural death during the war.
3. In case of defeat, he would not seek asylum in a neutral country; he would probably commit suicide.
4. He had manic tendencies and he was deteriorating mentally.
5. He was prone to sadism.
6. He was a loner.
7. He was not a good conversationalist.

The profile generally corresponded with Hitler's character. The US government was interested in the final scenario; it took place as per prediction. Hitler did commit suicide on the eve of surrender. (CH)

33.10.3 Serial Bomber

George Meteskey was an infamous serial bomber of USA. He exploded bombs in public places in New York City during 1940-1956. When the police failed to trace the bomber they requisitioned the services of a profiler, Dr. JA Brussel, a psychiatrist, working in mental hygiene department of the city.

Dr. Brussel studied the crime scenes (from photographs) and the mail the bomber sent to press. He built up a profile of the bomber:

1. The bomber is a heavy built unmarried single middle-aged man who wears a double-breasted coat.

13. Relatively recently DNA profiling of seminal stains and bloodstains matched with a suspect's DNA. The suspect was Aaron Kosmink, a Jew Polish barber; a different person from the one convicted, more than 100 years ago, on the basis of criminal profiling.
14. WC Langer, *The Mind of Adolf Hitler,* 1972.

2. He is a Roman Catholic immigrant. He is a skilled mechanic. He lives in Connecticut.
3. He has a strong grudge against the Electric Power Supply Company (Consolidate Edison) and wants to takes revenge against it. (He exploded the first bomb in its Headquarters).

The above profile proved useful to the police. They guessed that the culprit has to be a past or present employee of the company. The check-up led them to Meteskey who, on arrest, confessed to the bombings. The prediction of the profiler was true to the very letter.

"Meteskey was an ex-employ of the company. He was a heavy built unmarried middle-aged single man who wore a double-breasted coat. He was a Roman Catholic immigrant skilled mechanic, living in Connecticut." (CH)

33.10.4 David Meirhofer

David Meirhofer was a sadist sex murderer. In June, 1973 he abducted a seven year girl in early hours of the morning in Rocky Mountains in USA, from a tent. He overpowered her and she could not wake her parents who were sleeping nearby. Intensive and extensive search proved futile. The case was referred to Teten and Mulley, of the FBI, for profiling the culprit.

Teten and Murray studied the available data and came with a profile:

1. The culprit was most likely a young white male.
2. He was a sex killer.
3. He mutilated the bodies of the victim after killing.
4. He takes away sometimes body parts of the victim as souvenirs.

The police investigation on the basis of the profile led to the arrest of David Meirhofer who was a 23 old single white male. Search of his residence revealed body parts not only from the girl but also of another female. (CH)

33.11 CONCLUSION

Criminal profiling, as an aid to reach the unknown criminal, is apparently a very attractive mode to fight crime. It is very popular with the public and the media. Scientifically it is a tough nut to crack in spite of the fact that it has given dramatic results in some cases. But the present-day technology does not meet the requirements of criminal profiling. Extensive research is needed to make criminal profiling viable.

An ideal profile contains physical description of the culprit, his education standard, his behaviour pattern, his vocation, his social standing, his background, the geographical region from which he hails, his motives, his abuse of narcotics and most importantly, his idiosyncrasies (body parts collection!) in his behaviour before, during and after the commission of the crime. What else is needed to apprehend him? Practically nothing! But so far all the above elements are not available and the reliability of those which are available in some cases, is not quite trustworthy, beyond a reasonable doubt. The profiling has, therefore, not achieved the acceptability level of other branches of Forensics. Predictions of profiles are often half-truths. Some even mislead. Researchers are trying to make it a more reliable tool in the fight against crime. However, all said and done, criminal profiling has certainly limited utility in the investigation of crime.

33.12 ADDITIONAL READINGS

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CHAPTER 34

FORENSIC ANTHROPOLOGY

SYNOPSIS

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Fig. 34.1
The dead tells his tale

34.1 GENERAL

34.1.1 Forensic Anthropology

Anthropology has been providing evidence to the courts for centuries now, without the qualifying word **"Forensic"**. It is a recent addition to distinguish it from general Physical Anthropology or from other branches of Anthropology. The work relating to the specialty has increased so much that it did need a separate name. Thus, the *Avatar* has its new name **"Forensic Anthropology"**.

The word "Forensic", now known so well, means "pertaining to court or law". Anthropology means the science that deals with mankind, his evolution, changes in him over the passage of time and his activities in all its varied forms. It has many branches dealing with various aspects like social, biological (including DNA[1]), medical, archaeological and physical anthropology. However, the main branch that is helping the dissemination of justice is physical anthropology.

Physical anthropology is concerned with the physical aspects of the human body, their characteristics, developments and changes which take place continuously not only in a lifetime but also even after death. The body characteristics, continuous development and changes in the body are the wherewithals, which provide the Forensic Anthropologist with the evidentiary clues to assist the courts in deciding anthropological problems in criminal and civil cases. It also helps to identify lost persons under various circumstances including those who lose their memories.

Forensic Anthropology is, thus, the application of the science of Physical anthropology in the dissemination of justice. It follows its basic tenets and uses its tools and techniques. It has also developed (and is developing) its own tools and techniques with vengeance.

Forensic Anthropology helps to solve legal problems in which humans, their dead bodies, skeletons, bones or their fragments are involved.

Bite marks identifications are included in Forensic Anthropology by some physical anthropologists. However, since the development of Forensic Odontology as a separate speciality, the bite marks are included in the newly developed branch, **"Forensic Odontology".**

34.1.2 Forensic Anthropologist

Forensic Anthropologist has to be one:

1. Who is educated in physical Anthropology, has been trained in Forensic Anthropology, is engaged in research in the same or related field(s), and has published papers to his credit, works as Forensic Anthropologist?
2. Who has been initiated to the speciality through attachment, for a considerable time, to a renowned and experienced Forensic Anthropologist, working in a respected University or Institute, where Forensic Anthropology work is done routinely?
3. Who has acquired ample practical experience in solving legal problems involving Forensic Anthropology during his attachment period(s), and later?
4. Who is interested in the field and takes up the professional challenges seriously?
5. Who does not start with a pre-conceived idea about the outcome of the case he takes up? He starts the examination with an open mind. Collects both positive and negative evidential data and goes by the preponderance of the data.
6. Who does not accept the dictates of his intuition, hunch or supernatural revelations?
7. Who remains a man of science? His inferences flow from the observations he made and the data he collected during the examination.
8. Who has no enemy to punish and no friends to be saved?
9. Who is immune to temptation, influence and bias?

10. Who is aware of the Conformational Syndrome,[1] considers it and avoids it scrupulously.
11. Who has a liaison with Forensic Pathologists, physical Anthropologist, Osteologist and fellow Forensic Anthropologists? He consults them in all refractory and borderline cases.

34.1.3 Evidentiary Clues

Evidentiary clues in Forensic Anthropology are human beings, alive or dead, children or infants, young or old, males or females; but only when they are involved or concerned with some legal issue(s). The dead may be in any form: unchanged, dismembered, disfigured, mutilated or putrefying at various stages of putrefaction, skeletal remains (complete or partial), bones (one or more) or their fragments. They are all evidentiary clues if they are involved in criminal or civil investigations and trials.

34.1.4 Possibilities

Given proper questioned and standard evidentiary materials, equipment and expertise, Forensic Anthropologist can provide important forensic assistance pertaining to anthropological clue materials from his identity to the identity of his ancestry.

34.2 PRACTICAL POLICE WORK (PPW)

The location, collection, preservation and dispatch of the evidence relating to abandoned, lost or hidden dead bodies in varied forms (complete, disfigured, dismembered, putrefied, skeletonised or only bones) to the Forensic Anthropologist is the task of the law enforcement agencies.

34.2.1 Fundamentals

1. The identity (*vis-à-vis* the crime), authenticity, integrity and continuity of the chain of possession of the evidence seized, collected, preserved and stored is maintained beyond a reasonable doubt, through proper documentation and, whenever possible, through eyewitnesses. Proper inventory on the label tag, properly secured (sealed!) packages and movement log of the evidence go a long way to maintain the identity and integrity of the evidentiary clues.
2. All actions (seizure, processing, movement and storage) taken *vis-à-vis* the evidentiary clue is properly recorded on the case file or the register as per departmental instructions, for later verifications and production in the court, if required.
3. Forensic Anthropology is comparatively new to India and so far it is not utilised frequently. An average investigating officer has neither the basic knowledge nor the training, nor any practical experience worth the name to handle or process Forensic Anthropology evidence. He needs help of a competent Forensic Anthropologist. The investigations, therefore, need **S**pecial **I**nvestigation **T**eam (**SIT**) to ensure proper investigations. SIT should consist of:
    - **Chief Investigator:** He is the team chief from law enforcement agencies (police!). He should be an experienced police officer. He will have the over-all responsibility to assemble the desired team (also additional manpower in cases like mass murders or disasters), collect the necessary tools, assign duties to the team members and oversee that the team, individually and collectively performs their duties efficiently and competently. He writes a report on the examination of the scene of occurrence after completing its examination.

1. It is unconscious desire, on the part of the expert, to prove what has been suggested to him by the referral authorities.

- **Documentation Officer:** He has to be a technician of high order to document the work done at the scene. Photographic and video coverage of the scene and the evidence thereon is his main task. Preparation of site plan [sketches of the scene] including evidence thereon and recording the scene and the evidence may be his additional duties.

  Sometimes the services of a draftsman are requisitioned to prepare the site plan, especially in expansive and important scenes like those in mass murders or disasters.

  Descriptive documentation is sometimes done by the chief investigator himself.
- **Forensic Anthropologist:** guide technical aspects of seizure and preservation of the anthropological evidence. He is indispensable. In mass murders and disasters more than one Forensic Anthropologist may be needed.
- **Forensic Pathologist:** In massive death scenes like mass murders, mass disasters or extensive wide ranging fires, Forensic Pathologist(s) and other doctors are also needed. Even when single body intact or putrefied, is the exhibit. It is the Forensic Pathologist(s) who takes up the examination first. Forensic Anthropologist starts his investigation after the post-mortem. He utilises the findings of the Forensic Pathologist(s) in his evaluations.

The U.S. Public Health System with the support of Government has organised a team of forensic specialists called DMORT (Disaster Mortuary Operational Response Team). It consists of forensic pathologists, radiologists, forensic anthropologists, forensic Odontologists, fingerprint experts, security officers, funeral directors, computer specialists, photographers, and others, all working to establish the identity of the victims and to investigate the circumstances surrounding their deaths. They respond to all declared mass fatalities.

Team members are on call 24 hours a day.

4. The scenes of crimes in skeletal remains offer only one chance for its examination in most of the cases. The handler of the incident scene has, therefore, to remember: **"Now or never"**.

34.2.2 Scene of Occurrence

The concept of the crime scene has changed completely in recent times. It is no longer the sole site where the incident took place. It is not the lone place where the *corpus delicti* is hidden. It is not the vehicle which carried the *corpus delicti.* It is not the house of the culprit or the victim. Generally, it is a conglomeration of those sites where evidentiary clues pertaining to the case are found. For Forensic Anthropological purpose, it is comparatively easy to specify incident scene. It is mainly the place where the dead or their remains are discovered or located. The sites vary:

1. **Mass Murders Site**: mass murders are killing incidents where numerous persons are done to deaths for varied reasons. The usual modes of mass murders are gasification (through poisonous or suffocating gases) explosions, arson, shooting or sabotage.

   There are numerous dead bodies at the mass murder sites. They include many mutilated unidentifiable bodies. Their identification is not only a social responsibility but it is also a legal requirement. The investigating officer has to do all the legwork and control, guide and supervise the work at the scene. The ultimate identification has to done by the Forensic Anthropologists and other specialists (Medico-legal experts, Forensic Odontologists and Forensic experts).

   In Twin Tower Trade Centre explosion (New York, 2001) about twenty per cent of the 973 mutilated bodies were identified through Forensic Odontology. (CH)

2. **Mass Disasters Site:** Aeroplane accidents, rail accidents, road accidents, landslides, earthquakes and other natural disasters (Tsunami!) occur every other day. The processing of these scenes is also one of the primary duties of police. There are often mutilated bodies at the scenes of occurrences. Forensic Odontology helps the police to identify them.

   In Tsunami disaster (2005) 90% of the mutilated bodies were identified through Forensic Odontology. (CH)

   The handling of the mass disaster scenes follows the pattern of handling mass murder scenes.

3. **Mass Graves:** When a large number of persons are killed or die together, they are often buried together, in big mass grave(s). Later the necessity to identify a person(s) from the skeletons in the grave might arise. The skeletons including dentitions are sometimes the only glues to the identity of the decedents.

   The body of the Adolf Hitler was buried along with about a dozen persons. It became essential to identify his body remains to make sure that he is dead as there were rumours that he has escaped and fled to South America and that the news of his suicide was inspired and fake. The bodies (in boxes) were exhumed and his body remains were identified through his unique dental record (available with his dentist). (CH)

4. **Miscellaneous sites:** The body and their remains may be found at other sites including the following:
   (a) Burial sites.
   (b) Graves in graveyards.
   (c) Secluded disposal sites in jungles, hills, mountains and ravines.
   (d) Wells and pits.
   (e) Ponds, canals, rivers, seas and oceans.
   (f) Homes (basements, walls, compounds), hotels and houses.

   Laila Khan, an actor, and her family had been missing since February, 2011. Police had not been able to make head or tail of the case until 10th July, 2012. On the day while searching the farmhouse of Laila, the police came across two water pits, in the compound of the house. The pits were covered with earth. Digging the two pits, the police unearthed six skeletons!

   The identity of the skeletons were confirmed through anthropological evidence (and later through confession of the culprits to be that of Laila and her family. (CH)

   (g) **Trains, buses and cars**: dead bodies are sometimes abandoned in the vehicles.

34.2.3 Action

The scene of occurrence is the place where the culprit, the victim, the tools of *modus operandi* and the site along with the paraphernalia thereon come into close contact *inter se.* They exchange traces, creating a plethora of connecting and identifying clues. The investigating officer is the master of the domain and collects the clues!

If the scene is handled properly, more than half the work is done. It is rightly said that the success or failure of the investigation of a case largely depends upon the handling of the scene.

In handling the scenes, where Forensic Anthropology is involved, the investigator follows the following protocol:

- **Surveys the scene**: he walks through the scene to assess the investigative requirement and see how best the scene can be handled.
- **Plans the examination** of the scene and handling of the evidence thereon

Proper planning is indispensable when the scene is of mass murders, mass disaster or an expansive graveyard. Such scenes need a large number of investigators, many and varied specialists, extensive equipment and paraphernalia for handling the injured, the dead, the mutilated and other evidence. It is really mind-boggling in some cases.

The needs of the scene and the time needed to process the scene vary according to the nature and dimensions of the incidence.

> *Robert Pickton (also known as Pig Pickton) was a serial killer He had killed scores of women, 49 according to his statement; mostly prostitutes from the nearby area of Vancouver, Canada. It was suspected that the killer had hidden the bodies in his pig farm (about 7 hectares in area). The search for the remains of the deceased was earnestly taken up in 2002. The salient features of the crime scene examination are:*
>
> 1. *The area was divided into segments of 20 x 20 metres, for exploration. Each segment was excavated to the sterile point (the depth at which the soil was not soiled by human or animal activity), which varied from one metre to about twelve metres.*
> 2. *The earth dug out was examined by Forensic Anthropologists – In addition to human remains they also eliminated 45000 bones as being of animals! It took 5 years to complete the examination of the scene of crime.*
> 3. *One hundred Forensic Anthropologists were employed to sift the excavated debris from which the human remains were to be identified. They could identify the remains of six women positively and gave probable identity of about twenty females more. DNA test was used for confirmation in all cases of identification of exhibits.*
> 4. *It was a massive clue hunt at a crime scene: In brief the handling of the scene involved:*
>
> | | | |
> |---|---|---|
> | (a) | Time taken: | >5 years |
> | (b) | Anthropologist employed: | >100 |
> | (c) | Exhibits collected and examined: | >600,000 |
> | (d) | Photographs taken: | ~ 400,000 |
>
> 5. *Pickton was given life imprisonment for the murders of the six identified women, in 2007.*
> 6. *It was the largest crime scene ever examined in Canada2. (CH)*

Search for the evidence (clues) is the most important task at the scene. The search is so arranged that no demarked area is left uncovered or unprobed.

The following search modes are employed in important and expansive scenes of incidents:

1. **Visual Search:** one or more investigators do the visual search. The scene is searched[3] thoroughly adopting strip, zonal, criss-cross or spiral method depending upon the scene and the number of the searchers available. Disturbed foliage, if the scene is fresh, is a good indicator of some activity at the site. Likewise, if the body or its parts are freshly buried the surface of the grave is comparatively soft. The investigator probes the earth and detects the softness of the grave area.
2. **Search Dogs:** specially trained dogs (also called cadaver dogs) to search dead bodies or their remains have been extensively used for a long time now. They locate hidden bodies or their parts or their remnants which are possibly scattered in a vast area.

   Properly trained dogs have proved better searchers than humans. They perform best when the scene is least disturbed or trampled over.

2. For details see: *lculbert@png.canwest.com*
3. Chapter 4 for details.

3. **Modern Trends:** modern scientific methods are proving extremely useful in handling some scenes.
    - **Aerial Photography:** it is now being utilised in expansive (air disaster) and important scenes. It registers the limits of the scene, shows inter-space relationship of different articles at the scene and indicates the disposition of the evidence *inter se*.

Fig. 34.2

Aerial Photograph of the Pickton's Pig Farm (part). It took 100 Anthropologist to literally unearth (using excavators) 600,000 exhibits from 7 hectare farm and to link some of them to a score of bodies of the missing female victims (supra).

- **Metal Detectors:** humans often carry metal objects like watches and mobiles. The murderer more often than not leave the item with the victim while disposing off the body. The metal detectors can detect such object and thus, indicate the possible presence of the victim's body or its remains.
- **Remote Sensing:** ground penetrating Radars are used to detect buried objects.
- **Excavators:** Specially modified excavators are used for removing earth in expansive scenes. They are used to excavate human remains from large areas. They remove soil or dirt up to depth of few centimetres at a time at a regulated pace. The Forensic Anthropological technicians scrutinize the excavated soil for any foreign material in the soil. It is collected.

DNA profiling of the bones and other body materials is possible in most of the situations. It offers foolproof identity of the remains. It is, therefore, used to confirm the anthropological identifications. The confirmation pre-empts the defence plea of non-identity successfully.

34.3 FORENSIC ANTHROPOLOGIST IN ACTION

Identification of bones, their fragment, skeletal remains (complete or partial) or mutilated or putrefied bodies, complete or dismembered, is mainly the task of Forensic Anthropologist. They also determine the age of living persons.

Formerly, the anthropologist used to work in the laboratories only. Now he also goes to the scene so that the evidence or full value of clues remain intact during location, collection, packing, dispatching or in transporting. If the investigating team has a Forensic Anthropologist on its role, the scientist must visit the scene. However, in mass disasters (Earthquakes, Tsunamis, hurricanes, typhoons, cloudbursts, massive fires) and mass murders, not one but many more Forensic Anthropologist are required.

The Forensic Anthropologist, in Forensic Anthropological investigations, helps to:

1. collect correct clues at the crime scene,
2. identify the clues in the laboratory, and
3. understand expert evidence, through written report/oral presentation.

In the USA, usually Forensic Anthropologist starts expert work only after certification from the Forensic Anthropology Board.

34.3.1 Forensic Anthropologist at the Scene

The presence of a Forensic Anthropologist at the crime scene likely to bear anthropological evidence is desirable to oversee the discovery, location and of collection of the evidence. In cases like those of mass graves, more Anthropologists are needed.[4] He helps the investigation in many ways:

1. **He helps to locate the clandestine grave(s):** disturbed foliage, virgin soil, variations in the surface soil structure (soft grave area, depression or mound formation and artefacts around indicate the clandestine grave(s).
2. **He helps in the excavation of evidence:** to prevent loss, contamination or missing of important evidence.
3. **He regulates the pace of digging:** to ensure complete recovery.
4. **He provides leads:** to locate the questioned/standard evidence.

The Forensic Anthropologist provides guidelines only. The investigator does the physical collections/Preservation/packing/sealing of the evidence; as per law in India.

34.3.2 Laboratory Investigations

Forensic anthropological laboratory investigations are varied, time consuming and often the results are inconclusive. The investigations are, therefore taken up only in when DNA profiling fingerprints or Forensic Odontology does not identify the exhibits. The main tasks of a Forensic Anthropologist[5] are to:

1. Identify human bone and their fragments.
2. Ascertain whether the bones are from one or more than one source persons.
3. Determine the time of death.
4. Ascertain the cause of death.
5. Ascertain the nature of death: violent or otherwise.
6. Find the ancestry of the deceased.
7. Locate deformity/bone Injuries, malformation or healed fracture(s,).
8. Reconstruct face.
9. Fix the identity of a given skull through superimposition.
10. Segregate co-mingled bones if they are from more than one individuals.
11. Ascertain his or her sex, age, stature, and height.

4. In *Pickton's* case (*supra*) 100 Anthropologists were employed.
5. The discussion in the present works is only elementary; the technical details have been omitted.

Brief descriptions of some of the important tasks are given below:

34.3.2.1 Human bones

The first and the important step in all bone identification problem is to ascertain whether they are human or animal bones.

> *In Pickton's case (supra) while searching for the remains of scores of women, the Forensic Anthropologists separated 65,000 animal bones or their fragments. They were mixed with the bones of perhaps 49 or more women. (CH)*

The human bone or its fragment are identified in the following ways:

- **DNA profiling;** is the best tests to establish the human origin of a bone.
- **Blood test;** Precipitin test anti-human serum indicates if the bone is of human origin or not. The bone must carry the blood proteins.
- **Bone structures;** of human beings are different from those of animals. Thus, the skull, denture or pelvis of human are easy to identify. However, in some cases bone piece may defy identification.
- **Composition of ash;** of human bones is different from that of animals.
- **Large bones;** vertebrae, shoulder blades and long bones help.

Bones of One or More Persons: determination, if the given bundle of bones is from one or more persons, is comparatively easy. The Forensic Anthropologist sorts out the identified human bones in two sets: bones from the left side on one side and from the right side on the other side. A similar site is fixed for bones from a second person, and so on. The number of bone sites, thus formed, gives the number of persons.

The expertise in Physical anthropology and osteology is indispensable for the work.

34.3.2.2 Age Determination

Age determination of the foetus, of the living, of the dead and of the skeletal remains is often required. The main methods or indicators are:

34.3.2.2.1 Eruption of Teeth

The eruption of teeth is a fair indicator of the age of a child or of an adolescent. The eruption time can vary from person to person. The following tables give an approximate idea of the age, based on the eruption of teeth:

Table 34.1

Eruption Schedule of Milk Teeth

S. No.	Tooth	Age of appearance (in months)	
		Lower jaw	Upper jaw
1.	Central Incisor	6	7-8
2.	Side Incisor	7	9
3.	I Molar	12	14
4.	Canine	16	18
5.	II Molar	20	24

The milk teeth are pushed out and their place is taken by permanent teeth in due course.

The eruption periods of the permanent teeth in the adolescent (and youth) are given in the following table:

Table 34.2

Eruption Schedule of Permanent Teeth

S. No.	Tooth	Age of appearance (in years)	
		Lower jaw	Upper jaw
1.	Central Incisor	6-7	7-8
2.	Internal incisor	7-8	8-9
3.	Canine	9-10	11-12
4.	I Premolar	10-12	10-11
5.	II Premolar	11-12	10-12
6.	I Molar	6-7	6-7
7.	II molar	11-13	12-13
8.	III molar	17-21	17-21

Number of teeth also indicates age. The table below is the rough guide:

Table 34.3

Rough guide of age from number of teeth

S. No.	Total teeth	Age (in years)
1.	20	3–5
2.	24 (addition of 4 first molars)	6–11
3.	28 (addition of 4 second molars)	12–17
4.	32 addition of 4 third molars	18-24 onward

34.3.2.2.2 Teeth Development

Teeth development has been utilised extensively to determine the age of adults from twenty-one years of age onwards. There are numerous factors in the development of teeth morphology that help to estimate the age of persons, live, dead or their skeletal remains. They are highly complex. Proper inputs, however, can provide a close estimate of the age. The main indicators are:

1) Completion of the denture.
2) Completion stage of roots (erupted teeth!).
3) Rate of formation of enamel
4) Attrition of the crown
5) Formation of cementum
6) Transparency of root dentine
7) Root surface re-sorption.
8) Discolouration and staining of teeth
9) Changes in the chemical composition of teeth

Forensic Odontologists are doing a lot of research in this field. It is hoped that the age estimates will be more accurate in the coming times.

34.3.2.2.3 Sutures' Closure

There are three types of sutures on the outer surface of the skull. They are open at the time of birth, but with time, they start closing. The extent of closures offers a guide to the age of the victim.

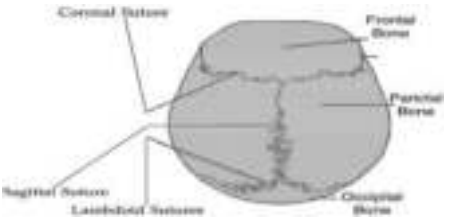

Fig. 34.3

Sutures on the Skull

34.3.2.2.4 Inner (endocrinal) Sutures

Forensic Anthropologists have studied the closures of endocrinal sutures of the skull. They found that they give a better estimate of age.

34.3.2.2.5 Epiphyseal Union

Epiphyseal union of various joints in the body gives fair estimates of the age of a victim. As in all physical growths, there are individual variations, absolute age cannot be given. The following table can be taken as a rough guide for the age.

Table 34.4

Age in years, from Completion of Acto-Epiphyseal unions

S. No.	Age	Body part
1.	14	Elbow
2.	15	Hands and feet
3.	16	Ankle
4.	17	Thigh
5.	18	Knee
6.	19	Wrist
7.	20	Shoulder
8.	21	Hip
9.	29	Clavicle (Proximal end)

34.3.3 Sex Determination[6]

The determination of sex of skeletal remains obviously was based upon the variations in the bone structures of male and females, which crop in due to different nature of work over the generations and lifestyles. It is an important step for the identification of the victim as it eliminates 50% of the victim suspects and it is almost the first step after the bones had been identified as human bones. However, sex determination from the bones is not an easy task. Even the experienced Forensic Anthropologist meets his Waterloo in this specialty. The reasons for the same are simple. The bony variations do not depend upon the sex alone; other factors intervene. Among the numerous factors the prominent ones are:

1. Race (ethnicity, ancestry),
2. Traditional division of labour (work) among the sexes through ages,
3. Working class or non-working class, and
4. Idiosyncrasies in bone structures.

In spite of the inhibiting factors, opinions on the sex of the remains were being given day-in and day-out, though the courts would take them with a pinch of salt. The Forensic Anthropologists take the following features into consideration while evaluating bones for sex determination:

34.3.3.1 General Appearances

The preliminary examination for sex differentiation relates to the general aspects of some bones. The table below is the one used for the purpose:

Table 34.5

Sex Differentiation

S. No.	Feature	Female	Male
1.	General size	Small	Large
2.	Architecture	Smooth	Rugged
3.	Supraorbital margin	Sharp	Round
4.	Mastoid Process	Small	Large
5.	Occipital bone	Muscle lines un-marked	Marked Muscle lines Protuberance
6.	Glabellas	Flat	Bony
7.	Gonial angle	Wide angle	Square
8.	Palate	Small parabola type	Large, u-shaped
9.	Occipital Condoyle	Small	Large

When the whole skeleton is available, and its ethnicity is also known, Forensic anthropologist using total evidence from all relevant parts, make fairly accurate identifications about the sex of the skeleton. However, the most important body parts are pelvis and skull in that order.

6. DNA, for sex determination has made the discussion on the subject redundant. Cortical and cranial **bones**, as well as teeth, were found to provide sufficiently preserved **DNA** for analysis. The **sex** was **determined** from skeletal remains of 18 individuals, including young children, out of 22 examined from periods ranging from 200 to around 8,000 years.

34.3.3.2 Pelvis

Pelvis carries many prominent reliable sex indicating formations. Nature has created female pelvis to allow the easy expulsion of the child at the time of delivery. The main difference used by the Forensic Anthropologists is the ischium and pubic index, which is the ratio of the lengths of the pubic and ischium. An easily identifiable distinguishing feature is the size of the hips. The male has narrow hips and the female has broad hips. A Forensic Anthropologist, in addition, carries out many other measurements to arrive at the correct conclusion.

34.3.3.3 Skull

Male and female skulls (cranium) also offer many points of dissimilarities. They help to distinguish the sex of the skeleton of the victim. For example, Forensic Anthropologists:

- Check the presence of ridges above the eye-sockets. They are present only in males.
- Scrutinise the bones below the ears and the occipital bones. They are sturdier in males than in females.
- Evaluate the skulls. They are smoother and smaller in females of the same ethnic group than those in males.

34.3.3.4 Examine jaws

Females have parabolic shaped and males have "U" shaped jaws.

34.3.3.5 Miscellaneous

If the Forensic Anthropologist is not satisfied with the data from the above evaluations, he examines other body parts:

- Bones: humerus, ulna, and femur
- Clavicle
- Scapula
- Tibia

They help. However, as noted above, the modes are no longer tried. DNA provides the way to determine sex from bone.

34.3.4 Mode of Death

When the whole body is available, a medico-legal expert ascertains the cause of death: natural, homicide, suicide, accidental or unknown. Forensic Anthropologist determines the cause of death from skeletal remains. It is possible only when the bones have been damaged he may be able to ascertain fall injuries, mechanical violence injuries, sharp edged weapon injuries or firearm injuries. Usually, he consults a medico-legal and Forensic expert for this determination.

34.3.4.1 Gunshot Injuries

Gunshot wounds are created in shooting cases. The firearms used vary. Shotguns, rifles, pistols and revolvers (either factory-made or improvised) are used. The projectiles may pass through bones, get embedded, graze along the bone. In almost all cases it is possible to identify the gunshot damage through:

- Characteristic entry wound formation, with crater formation on the exit point.
- Presence of projectile(s) or their fragments on the surface embedded in the body.

- Scraped material from the projectile around the projectile mark, including GSR (Gun Shot Residues)
- Embedded gunshot residue on the bone in close range shots where the bone is close to the skin (skull!).

Once skeletal remains were discovered in a jungle. It was sent to the local medico-legal expert. It was found that there were a number of pellet in the skeleton ribs. It was suspected that the victim had been done to death through shotgun shooting using pellet charge.

But who was the victim?

Police investigations revealed that some years earlier, a patient from a close by mental hospital had run away after he tried suicide with a shotgun. However, he had been X-rayed before he ran away. The pellet pattern on skeleton corresponded with the pattern on X-ray. (CH)

34.3.4.2 Blunt Weapon Damage

The blunt weapon may be a stone, a wooden stick, an iron bar or a pipe. The striking edge is blunt (as against sharp edge) and somewhat broad. Sometimes its blow is so forceful that it fractures the bone.

Blunt weapon injuries can be identified in most of the cases and in some cases; the nature of the weapon can also be identified.

34.3.4.3 Cut Marks

Sharp-edged weapon cause cuts to create incised wounds. Knives, swords, Kukris, sickles and axes. create the cut marks. They may be through and through cut or hole or partial cuts. The sharp-edged weapons can also cause stab wounds.

A hand magnifier improves the visual examination. Radiography helps to locate invisible embedded materials (projectiles, their fragments and pieces of broken weapons) in the body/bones.

34.3.5 Determination of Stature

34.3.5.1 Long bones

Forensic Anthropologists mainly use the principle that the height of a person is directly related to the lengths of various bones. They have developed multiplying factors for most of the bones useful for the purpose. The standard error for each result is taken into consideration. The bones usually utilised and their multiplying factors are given below:

Table 34.6

Height Determination

S. No.	Bone length (B)	Multiplier factor (F)	B x F	Constant (K)	±Standard Error (O)	Stature Height S=(BXF+K) ± O
1.	Humerus (H)	3.26	3.26H	62.10	±4.43	3.26H ± 4.43
2.	Radius (R)	3.42	3.42R	81.56	±4.30	3.42R ± 4.30
3.	Ulna (U)	3.26	3.26U	78.9	±4.42	3.26U ± 4.30

34.3.5.2 Complete Skeleton

If a complete or near-complete skeleton is the exhibit, the bones are laid in the order they are present in the body and its length is measured. Flesh and skin factor (**~35 cm**) is added to get the height of the live person.

It may be noted:

- The long bones are in pairs (on the left and right sides), lengths for calculations are taken as the averages of the two in each set, whenever they are available.
- Usually, heights are given in limits: upper limit is with positive standard error and the lower limit is with negative standard error.
- The long bones are measured on a standard osteometric board for accuracy.

The estimation of height is fairly accurate most of the time, in competent hands.

34.3.6 Identity of the Victim

Earlier, the most crucial aspect of a Forensic Anthropologist's work was to identify a victim from his skeleton remains. In most of the cases, it was an uphill task. It is not so now. The following modes and methods and pieces of evidence help them to establish the identity:

1. **DNA Profiling:** has brought in a revolution in the identification of the dead from the skeletal remains, bones, and even their fragments. Nuclear DNA is often available. Mitochondrial DNA is usually available even in old bones (*supra*). When DNA profiling is available anthropological identification acts as corroborative evidence only.
2. **Fractures:** all fractures are unique. If a person has suffered a fracture in his lifetime, it structural form continues even after death on the skeletal remains, even after it is healed. It permits identification of the person if the original X-rays record is available. Comparison of the record with the fractures (healed or otherwise) indicates the identity of the deceased.

   A completely charred body was recovered from the debris of a burnt house which was occupied by a single owner. It was suspected that the body belonged to the owner.

   The owner was known to have suicidal tendencies. A few years earlier, he had attempted suicide with a firearm. A Radiograph was taken. It indicated several small fragments of projectile lodged inside the body. The fragments were not taken out.

   A Radiograph of the charred remains was taken. It indicated all those fragments in the body at relevant positions. It identified the deceased. (CH)
3. **Deformity:** any bone deformity in any body part of the victim can help to identify him from his skeletal remains. Deformities of head, legs, arms and neck are characteristic. A careful study of the same leads to the identity of the deceased.

   A few years ago, a skeleton was recovered from pit. Its identity had to be established. It was sent to a medico-legal expert. The expert discovered thickening of the neck bone on one side. He concluded that the deceased had deformity on the neck. The head remained tilted to one side. The information led to the identity of the deceased. (CH)
4. **Diseases:** certain bone diseases affect bone structures. If the skeletal remains show depredation of disease, it fixes (or excludes) the identity. A lifetime radiographs of the affected bone established the identity.
5. **Skull Superimposition:** it was frequently used for the identification of the deceased. Identifications from the 1:1 skull transparency (photograph) and life-size photographs of the suspected victim are made by superimposing the transparency over the life-size photographs of the head of the deceased. The positions of the nose, eyes, ears and chin should correspond. The superimposition (or non-superimposition) indicates the identity or non-identity of the suspect.

The use of computers has facilitated the manipulation of photographs (size adjustment, angle corrections, colour and contrast) and high quality evidence is thus produced and presented in the courts.

Three youngsters visited Morni hills, near Chandigarh. They took drinks and drugs. Late in the evening they had an altercation and one of the youngsters was strangulated by the other two. The dead body was thrown in the ravines, which ordinarily nobody visits. The skeleton of the body was discovered after a long time. Its identity via-a-vis the boy was established through skull superimposition. (CH)

The following anthropometric measurements of the actual skull, life-size photograph and ante-mortem life-size photograph of the person are taken and superimposed *inter se.* The following features help to establish a match or non-match:

- Total face height
- Face width
- Upper face width
- Lower face width
- Nasal aperture; height width
- Intra orbital width
- Orbital height, width

Seventeen persons were killed in a house collapse in Delhi, a few years ago. It was suspected that vibrations of generator caused the collapse. The bodies of the remnants of 16 persons were identified. The remnants of 17th person remained unidentified. They closed the case after a few months. The intelligence bureau, however, continued to investigate. They found that one of the terrorists was missing from the date of occurrence of this collapse. Were the remains of the seventeenth person of the terrorist? They wanted to check.

Skull superimposition technique identified the remnants to be that of the missing terrorist.

Presence of RDX in that debris established that the house collapse was due to an explosion, not due to generator vibration as first suspected. (CH)

In comparison of facial features of ante-mortem life-size photograph, skull morphology of the skull the following points are measured and compared:

- Eyebrows,
- Medial margins of the slit,
- Lateral margin of eyes,
- Position of moustache,
- Position of closed mouth,
- Face outline,
- Nasion,
- Position of the ear,
- Position of nostrils,
- Height of nose,
- Width of the nose,
- Width of mouth,
- Maximum width of nasal bridge, and
- Lip height.

In the famous Ruxton case, the superimposition of transparency of skull over the photographs was utilized for the first time. The technique proved useful in the differentiation and identification of the two murdered women.

The technique has been extensively modified and exploited since then. (CH)

A few years ago, an inmate escaped from a mental hospital. A thorough search of nearby localities proved futile.

After about a year, a skeleton was recovered from a jungle about 10 miles away from the mental institution. The remains of the clothes indicated that the deceased was an inmate of the mental hospital.

Several patients had run away from the hospital during the past few years. The dental charts were, therefore, checked and compared with the denture of the recovered skeleton. The comparison indicated that the deceased was probably the above referred patient.

The identity of the deceased was further strengthened through a radiograph of the spinal vertebrae, taken in the hospital before the patient escaped from the hospital. It corresponded with the vertebrae of the skeleton. (CH)

6. **Face Reconstruction:** there are two methods of reconstruction of face from a skull. In one, clay is used to cover the skull or cast and the "skin" is coloured according to the suspected victim's skin colour. A Forensic Anthropologist works along with a sculptor and an artist. The shape, size and colour of nose, ears and hair have to be guessed.

   In the second method, computer is used for Facial Reconstruction. The technique needs:

   - A 3-D scan of the skull,
   - A CT scan of the head of a similarly built person, and
   - Special software in the computer to manipulate 3-D images and CT pictures.

   The computer face reconstructions are becoming popular and they are being improved continuously. They are likely to obviate the use of clay technique.

7. **Post-mortem Interval:** Determination of post mortem interval, from the human skeletal remains, is a hard nut to crack for Forensic Anthropologists. There are innumerable variables that affect the post-mortem changes in a human body especially after it is reduced to a skeleton. Prominent variables among them are:

   (a) **Confinement place:** kept in a box, closet or other closed compartments, basement, almirah. or buried. Or; thrown in open: jungle, desert, ravine, hill or mountain side or, given a watery grave where fish and other water fauna change the remains.

   (b) **Fauna of the place:** microorganism, insects, rodents, animal and beast. They destroy or change the body remains. Or, scatter them.

   (c) **Soil characteristics:** acidity of the soil hastens the deterioration of bones.

   (d) **Environment:** temperature, humidity of the place may hasten or retard the changes. Snow preserves body.

   But post-mortem interval is an important entity. Forensic Anthropologists try to find answer to the question. In USA, the scientists are studying the Post-mortem Interval in a big way. They have created a Body Farm where the dead bodies are kept under observations and their conditions are studied at regular intervals. The researches should prove useful for the task. If the body is thrown or buried with clothes on, the rotting of the clothes also provide estimate of the time of death. In addition to the quality of the apparel, the usual factors (environmental climate, soil, fauna of the place!) affect the rotting of the clothes. The interval will vary from one climate zone to another zone.

8. **Ethnicity (Ancestry, Race):** a lot of research has been done and is being done to ascertain ethnicity of the skeletal remains as it is not only a discriminating feature in the identification process but it also promotes correct identification of sex. Interbreeding among the races has made racial discrimination a difficult task except in determining the ethnicity of the aborigines and in some tribes where there is not much interbreeding.

Anthropologists have described the main ethnic groups:

1. Caucasoid (narrow face and chin, long nose!),
2. Mongoloid,
3. Negroids (broad face, wide nose)
4. Australoids and
5. Polynesians.

Perhaps this is an exercise in futility! It is said that there are more variations in intra-racial group than in inter-racial groups.

34.4 PRESENTATION

Forensic Anthropologist presents their findings in the form of a report, oral presentation; or through both modes. In his presentation, he strives to:

1. Give complete inventory of the exhibits he had examined and identifies them in the court.
2. Use simple words (no jargons!), easily intelligible to an ordinary educated person.
3. Ensure that the report is free from double interpretation and ambiguities.
4. Base his finding on adequate data,
5. Inform about the tools and the techniques used.
6. Indicate, briefly, the salient features of his experiments, observations, data and inferences.
7. Discuss negative evidence and justifies its exclusion.
8. Give clear, concise, precise and intelligible conclusions.

34.5 ADDITIONAL READING

Byers, S.N. (2008). *Forensic Anthropology*. Boston: Pearson Education LTD.

34.6 SUPREME COURT CASES

(21st Century)

34.6.1 Forensic Anthropology in Action[7]

Author's Summary

The prosecution case is that the culprits murdered the victim by exploding a crude bomb and threw the body, later recovered by the police as bones and skull. A medico-legal expert identified them as those of the victim. The defense expert opined that the evidence was not sufficient to fix the identity of the deceased.

The high Court finding variance in expert evidence and taking into account the limited damage by the explosion acquitted the accused and remarked it is not safe to convict persons on murder charge when neither the identity of the victim is not proved nor it is established that the death was homicidal. The SC concurred with HC.

It is unfortunate that HC did not ask for DNA test for identity.

Highlights italicised

7. *State of Andhra Pradesh v Karanam Balarama Krishna Murthy*, JT 2002 (10) SC 551; Bench per Umesh Banerjee and Shivraj V. Patil JJ, [DOJ: 23 October 2002.

5. Before proceeding further in the matter, a brief factual aspect as found in the prosecution case may be adverted to at this juncture. On 30 June 1987 at about 8.30 p.m. at Jampanivari Cheruvu all the five accused persons had formed an unlawful assembly in furtherance of the common object, they had murdered one Nallapaneni Venkata Subbaiah by exploding country made bombs. The dead body was said to have been taken away and thrown somewhere by them. All the five accused persons had denied their guilt, but four out of five were found guilty and convicted and sentenced as aforesaid. The remaining one was acquitted.

6. Peculiarity is the hallmark in the matter under consideration as regards the prosecution case, since beyond a certain point there is no evidence available on record excepting the opinion evidence of a medical practitioner. Significantly, the body of Nallapaneni Venkata Subbaiah was not recovered but what was recovered were certain bones together with the remnant of a skull The prosecution case obviously hinges strictly on the opinion evidence of one Dr. K Krishna Reddy (PW-20) wherein it has been stated as below:

My opinion regarding this case is:

1. The bones belonging to human being.
2. From the evidences present on the skull and mandible and 1st concave vertebrae it can be said that the bones belong to a male individual.
3. The evidence present on the spinal column, skull and mandible it is possible to say that the age of the individual would be about 40-45 years, but the fact cannot be confirmed authentically.
4. The stature of the individual cannot be given.
5. Since there is no duplication of bones, it cannot be disagreed that they belong to single individual, but the same fact cannot be confirmed as there were no articular surfaces to the bones.
6. There were no signs of ante-mortem injuries or haemorrhage.
7. There were no signs of ante-mortem of post-mortem burns.
8. *The identity of the individual can be established from the absence of right 1st molar teeth in the lower jaw as it had fallen off years back and its cavity was filled by calcification completely. The left three molars of the lower jaw might have fallen off long back at least a minimum of 2 to 3 years.*
9. Time since death is about 2 to 3 months.
10. The cause of death cannot be given as there were no positive evidence.

Exhibit P. 15 is the certificate given by me. The contents mentioned in the report exhibit P. 45 are correct. After reading the report, I can identify the skeletal remains which I examine, if they are shown to me. M.Os. 1, 2, 8 and 10 are the skeletal remains that were sent to me for post-mortem examination. (Exhibit P. 45 marked because the accused has no objection in marking the same).

7. Significantly, we have on the record another piece of evidence tendered by one Dr. D Govindaiah (PW. 25) wherein the witness stated as below:

The skeletal remains were received by me in two stages. One set of bones were received by me on 26-10-1987. Another set of bones were received by me on 19-11-1988. I examined which those were received by me on 19-11-1988. I examined those skeletal remains and gave the certificate, opinion and the details of my examination by me as well as conclusions for the opinion. The following are the conclusions, opinion of my examination with respect to the above said skeletal remains.

1) *The anatomical configuration of all the bones were consistent with that of human bones.*
2) *It was possible to say that the age of the individual was about 50 years though the age estimation from the skull bones was variable.*
3) *The sex of the individual was male.*
4) *It was possible to say from the examination of all available bones that they belong to a single and same individual.*
5) *The stature that is the height of the individual could not be calculated as there was no single long bone intact without any post-mortem destruction by animals.*

8. The cause of death could not be determined from the available bones as there were no ante-mortem injuries to them.

9. All the long bones only show post-mortem destruction by animals by gnawing and eating at their particular ends. It was possible to say from the study and nature of destruction and presence of canine holes that the damage has been caused by canine animal's *viz.*, "dogs and foxes.

The evidence of experts thus vary in its evidentiary effect. The issue thus arises whether it would be otherwise safe to convict four persons under section 302 of the Indian Penal Code with punishment for life imprisonment or not. The criminal jurisprudence of the country requires us to reach more or less a certainty without which it would be well neigh impossible to convict a person. As noticed above, is it safe or otherwise risky to convict on the state of evidence available to the court by the two medical professionals. The High Court, however, answered the same in the negative.

10. *In its order the High Court was pleased to record the following:*

There were no signs or evidence of

(I) There was no direct evidence to prove that the deceased Naliapanenj Venkata Subbaiah died on 30-6-1987.

(II) The dead body was not recovered.

(III) The FIR was lodged on the next day at about 8.15 a.m....in a nearby police station without any reasonable explanation for the delay and without any indication as regards the death or nature of death of the deceased Nallapaneni Venkata Subbaiah.

(IV) The time or place of occurrence have been delightfully left vacant though the informant claimed to be an eye-witness.

11. It is this state of evidence led by the prosecutor which stands very severely criticised by the High Court and consequently recorded the following:

No offence under section 302 of the Indian Penal Code can be made out without proving that the victim under consideration was dead and that the death was homicidal in nature. In the present case, the prosecution has utterly failed to prove either of them and, therefore, all the appellants in the first two appeals are entitled to acquittal of the charge under section 302 IPC.

12. Needless to record that the High Court also has acquitted the accused persons under section 201 of the Indian Penal Code as well.

13. Mr. G Prabhakar, learned standing counsel for the State of Andhra Pradesh rather emphatically contended that by reason of the evidence available on record, question of having an order of acquittal would not arise in the matter at all. He has been rather emphatic as regards the reliance on the evidence of Dr. K Krishna Reddy (PW-20). While it is true that one of the doctors did opine that in fact the skull matches with the bones but the selfsame doctor as noticed above did say that as a matter of fact it is not possible to authentically state that the bones belong to one person.

14. Mr. Sushil Kumar learned senior counsel appearing in support of the appeals arising out of special leave petition (criminal) Nos. 3578-3580 of 1994 contended in the similar vein as by the state counsel, Mr. G Prabhakar, and supported the case of the prosecution. Mr. Sushil Kumar's attempt to impress upon the court that on the wake of the evidence of Dr. D Govindaiah, the question of acquittal would not arise.

15. *The acceptance of evidence of Dr. Krishna Reddy can be had in the event, however, the same is otherwise creditworthy. On the one hand, it has been stated that the factum of the bones of single individual cannot be confirmed as there were no articular surfaces to the bones but on the next breath, the witness goes on to clarify that there is in fact identity of the skeleton remains with the bones. As noticed above, the High Court did not think it fit to rely thereupon as it would be rather risky to depend thereon for the purposes of having a conviction under section 302 of the Indian Penal Code. We also do think it fit to record our concurrence therewith. The evidence stands out to be too shaky and weak on which reliance cannot be placed in the matter presently under consideration.*

16. Incidentally, the High Court has also in paragraph 4 of the judgment recorded its disagreement with the prosecution case as regards the applicability of section 3 of the Explosive Substances Act. We do feel it expedient to record our concurrence therewith as well by reason of the fact that the injuries on the person were superficial in nature and could not be said to be as a result of any bomb explosion and no vehicle or any other property could also be proved to have been damaged as a result of such a bomb attack.

34.6.2 Identity of Scattered Body Parts[8]

2. The facts of this case are very shocking and very distressing. Murder is committed of a young boy, the only son of his parents, who at the relevant time was studying for a medical degree. The manner in which he was killed and his dead body was disposed of after cutting it into different pieces was very gruesome and ghastly. The person in the dock and who was accused of the crime was another senior student in the same campus.

3. Brief relevant facts leading to the registration of the first information report and giving rise to the present appeal are being set out hereunder.

4. In the academic year of 1995–1996 the respondent-accused was studying in the senior first year course of MBBS and the deceased Navarasu, son of Dr. PK Ponnusamy (PW-1), a retired Vice-Chancellor of Madras University, was studying in the junior first year course of MBBS in Raja Muthiah Medical College, Annamalai University, Annamalai Nagar. The respondent was staying in Room No. 95 in E-1, Malligai Hostel belonging to the same medical college campus.

5. P.W-1 returned from his foreign trip on 7 November 1996 and was waiting for the arrival of his son Navarasu from college to celebrate Diwali which in that relevant year fell on 10 November 1996. When Navarasu did not return home till 9 November 1996, PW-1 started enquiring from the friends of his son, available at Madras but no information of his whereabouts could be gathered by the father. PW-1 then on 9 November 1996 rang up the university authorities to find out and ascertain the whereabouts of his son. When he was informed that the college authority found his hostel room locked and when it was broken upon, it was found that his belongings along with a small box were lying in the room but he was not available in the room.

6. The college authorities and the father were of the opinion that Navarasu had not left for Diwali to Madras, PW-1 thereafter rushed to the university on 10 November 1996 and made a complaint of missing of his son at about 11.30 p.m. on 10 November 1996 which was registered as Crime No. 509 of 1996 (Ext P-1).

7. While this process was going on and without the knowledge of Annamalai Nagar Police, a torso was recovered at about 8.30 a.m. on 7 November 1996 by G Boopathy, Inspector of Police, E-5 Pattinapakkam (PW-55), from PTC Bus-Depot at Mandaiveli Madras based on the information given by Prakash (PW-53), conductor of the bus. Route No. 21-G. The said recovered torso was sent for post-mortem after inquest.

8. Annamalai Nagar Police after registering the missing report started investigation and during the course of such investigation gathered materials and also received information from various persons including students of the college pointing the guilt towards the accused, who was also found absconding from the college premises from 12 November 1996 to 14 November 1996.

9. On 14-11-1996 the accused surrendered himself before the Judicial Magistrate, Mannargudi. The message of his surrender was conveyed to Annamalai Nagar Police Station, which got the police custody of the accused for five days from 18 November 1996. On 19 November 1996 at about 1.30 a.m. the accused gave a confessional statement stating that he has put the severed head of the deceased in the boat canal within the university campus. Pursuant to the said confession, the head was also recovered, Annamalai Nagar Police Station on 20 November 1996 asked E-5, Pattinapakkam Police Station for sending the records connected with the torso recovered at Madras on the suspicion that it may belong to the severed head of the deceased Navarasu, which was recovered at the instance of the accused Dr. K. Ravindran (PW-66) conducted autopsy/post-mortem of the head at 10.00 a.m. on 21-11-1996.

10. On 22 November 1996 a message was received from Villupuram Control Room which was forwarded to Annamalai Nagar Police Station which mentioned that three human bones femur, Tibia and fibula have been recovered at 1.30 a.m. on 21 November 1996 from the seashore of Konimedu of Merkanam based on the information given by the Village Administrative Officer concerned, Nagarajan (PW-43). Post-mortem of the limbs were conducted by Dr. Srinivasan (PW-45) and later, the limbs were sent to PW-66.

8. *Inspector of Police, Tamil Nadu v John David*, 2011 AIR SCW 2764 : (2011) 5 SCC 509 : 2011 Cr LJ 3366.

11. PW-66 after examining the severed head, the torso and three human bones abovementioned, found that there are scientific materials to hold that they belong to a single individual and also the fact that they belong to deceased Navarasu. The father (PW-1) of the deceased and Thandeeswaran (PW-60), nephew of PW-1, also identified and confirmed that the head and torso are of the deceased. For confirming the said fact, the blood samples of PW-1 and his wife Baby Ponnuamy (mother of Navarasu) were examined by Dr. G.V. Rao (PW-77) at Hyderabad by DNA test. PW-77 compared the tissues taken from the severed head, torso and limbs and on scientific analysis he found that the same gene found in the blood of PW-1 and Baby Ponnuamy, was found in the recovered parts of the body and that therefore they should belong to the only missing son of PW-1.

58. In the instant case, the fact that the severed head of the deceased Navarasu was recovered from the specific place which was indicated and identified by the accused, the recovery of other material objects at the indication/instance of the accused creates/generates enough incriminating evidence against him and makes such part of the confessional statement clearly admissible in evidence. The fact that the skull found in the water canal of the university belonged to Navarasu, deceased is proved from the evidence of Dr. Ravindran (PW-66), Dr. Venkataraman (PW-52) and G.V. Rao (PW-77).

59. PW-66 in his evidence has stated that the deceased appears to have died because of decapitation by injuries and that the injury is ante-mortem. The doctor also opined that a sharp cutting weapon would have been used for causing injuries. He further stated in his evidence that severing of head and removal of the muscles and nerve of limbs could have been one by MOs 9 to 11. PW-66 also opined that both the torso and head belonged to one and the same person.

60. Also from the evidence of Dr. Venkataraman (PW-52), Parasu Dental Clinic, Adyar, Madras it is found that he had given silver filling on the right upper first molar of the deceased and that he had removed the left upper milk tooth and removed the root thereof and the said fact was also clearly and rightly found in the post-mortem conducted by PW-66 on the head recovered from the boat canal. The said fact was also proved from the DNA test conducted by PW-77. PW-77 had compared the tissues taken from the severed head, torso and limbs and on the scientific analysis he has found that the same gene found in the blood of PW-1 and Baby Ponnusamy was found in the recovered parts of the body and that therefore they should belong to the only missing son of PW-1.

61. In the present case, the trial court relied upon the superimposition process/test made by Dr. Jayaprakash (PW-65), Assistant Director. Forensic Science Department, Madras, who stated in his evidence that the skull recovered was of Navarasu. Therefore from the evidence of PWs 65 and 66 it becomes amply clear that the skull recovered from the boat canal is of Navarasu only.

74. *Therefore, in our considered opinion prosecution has established its case on the basis of strong and cogent circumstantial evidence and that on the basis of the circumstances proved, there cannot be any other possible or plausible view favouring the accused. The view taken by the High Court is totally erroneous and outcome of misreading and misinterpreting the evidence on record.*

CHAPTER 35

FORENSIC ODONTOLOGY

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35.1 GENERAL

35.1.1 Definition

Forensic Odontology is a branch of Forensic Science dealing with teeth and marks left by teeth to identify criminal suspects or the remains of a dead person.

Forensic Odontology is also known as Forensic Dentistry. It is the application of dental (dentistry, Odontology) science in the dissemination of justice. In common parlance, it is the application of systematically organised knowledge relating to dentition, teeth, changes in them due to age, disease, accident, use or abuse, bite marks and artificial dentures in criminal investigation and trials.

35.1.2 Application

The main uses of Forensic Odontology include:

1. Identification of human remains (unidentified corpses, skeletons, skulls or dentures) from their denture.
2. Linkage of bite marks with the culprit in sexual abuse of females, children, spouses, imbecile persons and sometimes senior citizen. If a female has resisted the offender, she may bite the offender. The bite mark can link the culprit with the assault.
3. Determination of age of children/adolescents/young/old persons.
4. Determine if the subject is a minor or adult.
5. Identification of victims in mass disaster/mass graves.
6. Discrimination of bite marks whether they are of human origin or from the animal kingdom.
7. Reconstruction of the profile of the victim from the skeletal remains.

Dentures, teeth and teeth marks are often met within forensic situations where it is important to ascertain their source, to fix the identity of the source person, pet or wild beast: victim or perpetrator of a crime. Or, it is simply its application of Forensic Odontology to establish the identity of the person whose remains have been found; to identify a person who has lost memory, forgotten his identity, unable to recognise his near and dear ones and even does not know the place to which he belongs due to mental illness. Determination of age of a living person, corpse or skeleton also forms part of Odontology. It assumes great importance in some cases of murders, rapes and juvenile delinquency.

35.1.3 Background

It was known from time immemorial that teeth patterns of some persons are different from those of others. Such persons, with some prominent peculiar teeth pattern, colour tooth (teeth), diseased or missing tooth (teeth), odd extra tooth and uncommon structures of teeth could be distinguished from their teeth alone. But it did not amount to much and not used in Forensics. It was an odd identification from a limited group of persons. The need for such identification of persons was limited. Forensic Odontology (without the name) remained dormant for ages. The science has been named as Forensic Odontology. It is a new tool for the dissemination of justice. The demand for the expertise is increasing with the passage of time.

There is no doubt that the teeth pattern of each individual is unique. That is, it is different from that of any other person, including his or her parents, brothers, sisters, sons and daughters. Surprisingly, nobody has provided any experimental or statistical proof thereof. Nor, it must be appreciated; anybody has found the teeth of two persons alike. It is believed that the universal Law of Individuality holds which states that everything in this universe is unique. So are the tooth, dentures and teeth bites. No two teeth patterns, like fingerprints, of two different individuals, are alike.

Forensic Odontology is not being used extensively in India. It does not form part of the all forensics institutions, medical/dental colleges/departments. If a case comes up, it goes to:

1. A Dentist
2. A Forensic Pathologist
3. A Forensic Biologist
4. A Forensic Anthropologist

None of the institutions has developed the needed expertise. Consequently, the results are not satisfactory. It is hoped that Forensic Odontology is developed in the near future to help the criminal justice system. It may form part of dental colleges to start with and later become part of the major forensic institutions when the need for the expertise grows.

35.2 IMPORTANCE

Forensic Odontology has great potential in the criminal justice system. There is increasing awareness of its utility among the concerned persons. The availability, permanency, definite nature of the evidence in most of the cases where it is involved is its Hallmarks. It can reveal and tackle heinous crimes, sordid criminals and their *modus operandi*. Its need is bound to increase in the coming times.

35.2.1 Definite Identity

Like fingerprints, odontology provides definite identity (or elimination) of a corpse if the dental record (a dental cast(s), X-ray radiograph of the suspect's denture or the dentist's recordings) is available.

Definite identity is based on the numerous identifying characteristics, easily discernible: (~ 30 to 70) in various individuals' dentitions, their teeth orientation and in their repairs and treatment. They confer uniqueness to the dentition of a person. The prominent features, leading to individuality, are:

- The architecture of the dentition including roots,
- Position, size and shape of an abnormal additional tooth (teeth), if any,
- The dimensions of the dentures, teeth and roots,
- Inter-distances among the teeth *inter se,*
- Orientation of the teeth *inter se,*
- Twisted and tilted teeth,
- The number of teeth present originally and surviving healthy teeth at the given time. Disease, accident or hereditary factors and life style have different toll in different persons. The particular positions and the characteristic shapes identify the common source,
- The number and position of the missing, broken and diseased teeth,
- Wear and tear of the teeth,
- Extractions, and
- Repairs: fillings, materials used for filling, crowning, capping, root canal treatment, bridges, implants.

In Canada, a serial killer, infamous as "The Vampire Rapist", Wayne C Boden, had raped and killed many females during 1969–1971. His *modus operandi* included the biting of the breasts of the victims, which ultimately led to his conviction. He left no other tangible evidence at the scene or on the victim.

The investigating officer requested the local Odontologist to examine and compare the bite marks with the dentures of the suspect. He carried out the examination and consulted other experts from Canada and abroad. He demonstrated to the judge and jury ***29 matching points*** in Boden's denture and in the bite marks on the body of the last victim. The judge and the jury accepted his findings and convicted him on the sole evidence of bite marks. He was sentenced to life imprisonment.

It was the first case in North America where the conviction was based upon bite marks alone. (CH)

35.2.2 High Profile Crimes

Forensic odontology is involved in high profile crimes:

1. Murders, mass murders, kidnappings.
2. Sex crimes especially rape, gang rapes, sodomy, child abuse, spouse abuse, sometimes followed by murders and then hiding or destroying the evidence through burning, burial, dismembering the body, throwing it in secluded places or in water bodies where it may be discovered after years.
3. Dentition (and dental evidence) is long-lasting, almost permanent for all practical purposes. It can help the identification of the victim even after decades. Thus, the evidence is superior to even fingerprint evidence in permanency. Fingerprints are destroyed comparatively easily. The skin is eaten by the insects or putrefies!
4. It is possible to build a Post-mortem Dental Profile from the dentition taken from the disfigured body or skeletal remains. A thorough examination can provide the following information about the profile under favourable conditions:
   - DNA profile,
   - Age,
   - Sex,
   - Ancestry,
   - Occupation,
   - Dietary habits,
   - Smoker or non-smoker,
   - Drunkard or drug addict, and
   - Socio-economic status of the subject.
5. Forensic Odontology expertise can easily be organised. The normal dentist (odontologist) can pick up the expertise, if he so desires, after some specialised training.
6. Bite marks are found in many criminal cases. They link the criminal in many a case, but not in all cases. In some famous cases, the Forensic Odontologists have found ample evidence to get the culprits convicted on bite marks alone. However, in cases where bite marks fail to provide linkage, the saliva in and around the marks, if available, can identify the culprit via DNA profiling irrefutably.

35.3 NATURE

Forensic Odontology is classified into three main categories for the study of the subject more conveniently:

1. Identification of the living, the dead, the skeletal remains or the body remnants where dentition (or its parts) are available as identifying clues
2. The identification of bite marks and the biter
3. Determination of age

The three main branches of Forensic Odontology involve dentition, teeth, jaws (mandible and maxilla) mainly. They are the main source of evidence. It is, therefore, worthwhile to have a bird's eye view of their architecture.

35.3.1 Dentition, Teeth

The human teeth (20 in children and 32 in adults) are located (fixed) in the two jaws: mandible and maxilla in equal numbers (16 each). Teeth in each jaw are in the form of an arch. Each set is called dentition.

There are two classes of teeth: milk teeth and permanent teeth. Milk teeth start erupting at the age of about six months and the other at the age of about six years. The eruption of both types of teeth gives some idea about the age of the person.

The teeth are of four types: incisors, canine, premolar and molar.

35.3.2 Milk teeth

Milk teeth are also known as temporary or deciduous teeth. The maximum number of these teeth is usually 20, ten on the upper jaw and ten on the lower jaw. The ten teeth on each jaw are:

- Molars = 4
- Canines = 2
- Incisors = 4

The cavity formations for housing the teeth start from the 3rd or 4th month of pregnancy. The teeth start appearing in about six months' time after birth and eruption of milk teeth is complete in about two years. The following table gives a general idea of the eruption/shedding time of the milk teeth:

Table 35.1

Primary Tooth Development

S. No	Eruption time	Shedding time
Upper Teeth		
Central incisor	8-12 months	6-7 years
Lateral incisor	9-13 months	7-8 years
Canine	16-22 months	10-12 years
First molar	13-19 months	9-11 years
Second molar	25-33 months	10-12 years
Lower Teeth		
Second molar	23-31 months	10-12 years
First molar	14-18 months	9-11 years
Canine	17-23 months	9-12 years
Lateral incisor	10-16 months	7-8 years
Central incisor	6-10 months	6-7 years

35.3.3 Permanent Teeth

Permanent teeth start erupting usually in the fifth or sixth year. There are 32 permanent teeth. Sixteen of them are in the upper jaw (maxilla) and even number in the lower jaw (mandible). The sub-classification of the sixteen teeth in each jaw is:

- Incisors = 4
- Canines = 2
- Pre Molars = 4
- Molar = 6

Table[1] 35.2

Number and Numbering of Various Teeth

Teeth	Number	Assigned numbers in Upper Jaw	Assigned numbers in Lower Jaw
Incisors	4+4	7, 8, 9, 10	23, 24, 25, 26
Canine	2+2	6, 11	22, 27
Premolar	4+4	4, 5, 12, 13	20, 21, 27, 28
Molar	6+6	1, 2, 3, 14, 15, 16	17, 18, 19, 30, 31, 32

The permanent teeth of the human dentitions are given 1 to 32 numbers. There are various systems in numbering; the above being one of them. They are divided into four segments, the numbering and the divisions take the following form:

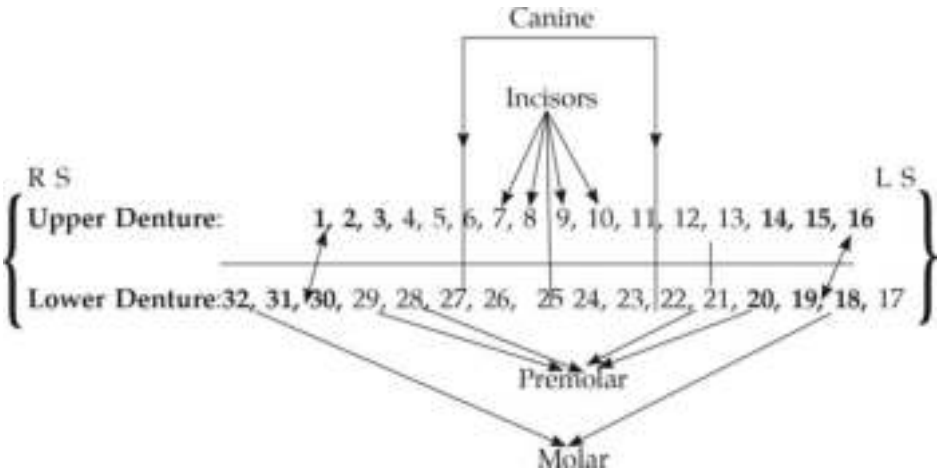

Fig. 35.1

Graphic Display of Teeth Architecture

1. American Universal Numbering System has been used in numbering the teeth.

35.3.4 Tooth Architecture

A tooth has the following important parts:

35.3.4.1 The Crown

It is the top part of the tooth. It is covered by hard enamel, which is white in colour unless some disease or dental hygiene neglect gives it some colour. As it is very hard, it withstands a lot of use or abuse in chewing and biting. The morphology of the crown and its surface characteristics provide identifying features of the bite marks.

35.3.4.2 The Root

The root of a tooth is covered by gums. It is embedded in the jaws. Canine, incisors and premolars have usually one root though in rare cases, canines and premolars may have two roots. Molars have two or more roots.

Roots have varying shapes, sizes and orientations *inter se*. They also vary from person to person. They provide significant differentiating features for identification.

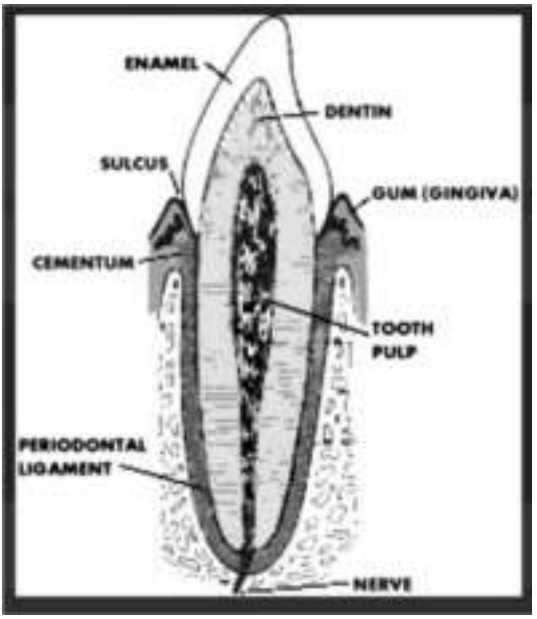

Fig. 35.2

Root of a tooth

35.3.4.3 The cavity

All tooth roots have cavities. They are also called root canals. They are filled with pulp and are connected to blood vessels through a nerve called root canal nerve. The root canal treatment and fillings provide discriminatory evidence. The pulp provides body cells for DNA profiling.

35.3.4.4 Saliva

The DNA identification has made the matters easy. The culprit is bound to leave saliva stains in and around the bite marks in all cases of bites, which provides foolproof identification or exclusion of suspect as culprit. But saliva is not always available. If the body is thrown in a

water body or the stain is washed off in a heavy downpour, DNA profiling is not possible. In such cases, only Forensic Odontology provides the needed evidence.

Saliva is not a specific constituent of Odontology. But it is an inseparable part of all teeth in the living being. It is transferred from the teeth (or through lips) to the bite mark site and is always there until removed by natural elements or otherwise. It can individualise the biter and decides the involvement or exclusion of a suspect "beyond reasonable doubt".

In fact, after the induction of DNA analysis in Forensics, saliva in or around the bite marks has assumed tremendous importance in the identification of the biter. It is believed that in the coming times DNA analysis alone would be used to fix the culprit's identity in those cases where saliva is available. Bite mark patterns will continue to rule the roost where the saliva is washed off or removed.

Teeth marks, in bites, are not clear many a time. DNA profiling via saliva, from the bite marks, will finish the uncertainty[2] in those cases where the marks are incomplete or unclear.

35.4 PRACTICAL POLICE WORK

Location, Collection, Preservation, dispatch and transport of the evidence to the Forensic expert is Practical Police Work (PPW), carried out by law enforcement agencies or by private investigators. It is essential that the investigating officer understands the basic principles and follows a set protocol to collect maximum and correct clues and information to ensure successful investigations.

They follow the general crime investigative pattern, yet because of the newness of Forensic Odontology and high complexity of bite mark collection and identification, the investigator needs a Forensic Odontologist to collect the bite marks correctly.

35.4.1 Basic Principles

1. The identity (*vis-a-vis* the crime), authenticity, integrity and continuity of the chain of possession of the evidence seized must remain beyond reasonable doubt, through proper documentation and, whenever possible, though eyewitnesses. Proper inventory on the label tag, properly secured (sealed!) packaged and movement log of the evidence go a long way to maintain the identity and integrity of the evidentiary clues.
2. All actions (seizure, processing, movement and storage) taken *vis-à-vis* the evidentiary clue must be properly recorded for later verifications, if required.
3. An average investigating officer has neither the basic knowledge nor the training, nor any practical experience worth the name to handle or process bite marks evidence. He needs the help of a competent Forensic Odontologist. The **S**pecial **I**nvestigation **T**eam (**SIT**) should have a Forensic Anthropologist to ensure proper collection of the evidence. SIT should consist of:
    - **Chief Investigator:** He is the team chief. He should be an experienced police officer. He will have the over-all responsibility to assemble the desired team (also additional manpower in cases like mass murders or disasters), collect the necessary tools, assign duties to the team members and oversee that the team, individually and collectively performs their duties efficiently and competently. He writes a report on the examination of the scene of occurrence after completing its examination.

2. In 2009, a member of the American Boards of Forensic Odontology surveyed the Bite mark identification cases. He found that the positive reports furnished by the Forensic Odontologists were wrong in 63% of the cases.

- **Documentation Officer:** He has to be a technician of high order to document the work done at the scene. Photographic and video coverage of the scene and the evidence thereon is his main task. Preparation of site plan, sketches of the scene, including evidence thereon and recording the scene and the evidence may be his additional duties.

  Sometimes the services of a draftsman are requisitioned for preparing the site plan, especially in expansive and important scenes like those in mass murders or disasters. Software has come up which can draw a 3-dimensional sketch.

  Textual descriptive documentation is essential part of documentation. The chief investigator writes the notes himself.
- **Forensic Odontologist:** He guides technical aspects of seizure, collection and preservation of dental evidence. He is indispensable. In mass murders and disasters, more than one Forensic Odontologist may be needed.
- **Forensic Pathologist:** Massive death scenes like mass murders, mass disasters or extensive wide ranging fires also needs Forensic Pathologist(s) and other doctors.

35.4.2 Scene of Occurrence

The handling of the scene of occurrence (crime scene) has been discussed in some details earlier[3]. Here the crime scene or disaster scene where Forensic Odontology plays important role has been discussed briefly.

1. Mass Murders: there are numerous mutilated bodies in mass murders. Their identification is not only a social responsibility but it is also a legal requirement. The investigating officer has to do all the legwork. The ultimate identification has to done by the Forensic Odontologist.

> *In Twin Tower Trade Centre explosion (New York, (2001) about twenty % of the 973 mutilated bodies were identified through Forensic Odontology.* (CH)

2. Mass Disasters: Air accidents, rail accidents, road accidents, landslides, earthquakes and other natural disasters (Tsunami!) occur every other year. The processing of these scenes is also one of the primary duties of police. There are often mutilated bodies at the scenes of occurrences. Forensic Odontology helps the police to identify them.

> *In Tsunami disaster (2005) most of the mutilated bodies were identified through Forensic Odontology.* (CH)

3. Mass Graves: When a large number of persons are killed or die together, they are often buried together, in big mass grave(s). Later the necessity to identify a person(s) from the skeletons in the grave may arise. The dentitions of the skeletons are examined and compared with dentures or dental data collected from the dentists of the suspected person(s). The evaluations link/de-link the skeleton to the suspect if proper dental record is available.

> *The body of the Adolf Hitler was buried along with about a dozen persons. It became essential to identify his body remains to make sure that he was dead as there were rumours that he had escaped and fled to South America and that the suicide news was inspired and false. The bodies (in boxes) were exhumed and his body remains were identified through his dental record (available with his dentist) which was unique.* (CH)

The other sites where Forensic Odontology evidence is found, include the following prominent sites:

1. Graves in graveyards
2. Burial sites

3. See: Chapter 4 of this book.

3. The secluded site where the body was disposed
4. Wells and pits
5. Ponds and canals
6. Homes (basements, walls, compounds), hotels and houses

   Laila Khan, an actor, and her family had been missing since February, 2011. Police had not been able to make head or tail of their whereabouts.

   On 10 July 2012, while searching the farmhouse of Laila, the police came across two water pits, in the compound of the house. The pits were covered with earth. Digging of the two pits unearthed six skeletons!

   The skeletons were supposed to be that of Laila and her family. DNA profiling, the better method than Odontology, was used to identify them. (CH)
7. Trains, buses and cars

35.4.3 Evidentiary Clues

Forensic Odontology evidentiary clues are generally limited. Most of them are:

1. Dentitions,
2. Teeth,
3. Repairs and restorations,
4. Fillings,
5. Bridges,
6. Root canal treatment,
7. Implants,
8. Bite Marks,
9. Saliva, saliva stains,
10. Artificial Dentures,
11. Casts,
12. Dental Radiographs,
13. Dental Records,
14. Dental eruptions,
15. Dental Ossification, and
16. Dental pulp.

The first ten items are found on the culprits, victims, dead bodies or skeletons or their remains; as the case may be. The last six items are usually found with the subject's dentist.

The sources for evidentiary clues are:

1. Live human beings
2. Dead bodies; at various stages of putrefaction/burning/mutilated bodies/ dismembered bodies.
3. Skeletal remains, skulls, dentures alone; anywhere and everywhere
4. Pets (in pet bite cases),

5. Odontologists' clinic(s): dental records, radiographs and casts of the dentures (partial or full) are found in the subject's dental clinic.

35.4.4 Bites on Dead or Live Body

If the teeth pierce the skin at the bite site of a live person, the injury bleeds. If the bite is inflicted on a dead person after the blood has settled, the injury normally does not bleed. However, if the bite is soon after death it bleeds to a varying extent.

The handling of the live, injured, dead bodies or skeletal remains is part of investigating officer work. It has also been discussed elsewhere[4]. The main task, however, is the processing of the dental evidence.

35.4.5 Action Protocol

The lead investigator plans, guides, controls and monitors the action protocol. The clue materials have to be located, collected, preserved, packed, transported, stored and evaluated. The steps are taken in such a way, as mentioned earlier, that their relevancy, identity, integrity, authenticity, continuity of the chain of custody is preserved and that legal formalities are observed in letter and spirit so that the courts do not question the validity and legitimacy of the evidence and reject it. The action protocol follows the general guidelines given in the chapter on "Scene of Occurrence and in Investigation of Death".

35.4.6 Standard Dental Data

The investigating officer takes the following steps to collect ante-mortem data (the standard data) for comparison:

1. Study the list and Portrait Parle of the missing persons of the nearby areas.
2. Get rough data from the expert (forensic Anthropologist!) about the age, sex, height and built of the person whose remains are being examined.
3. Compare the generated data with that of the missing person(s) and make a reasonable guess about the possible person(s).
4. Ascertain the dentist who has been treating the guessed missing person(s).
5. Collect the anti-mortem dental data (written record, radiographs and dental casts) of the subject from the dentist who had provided the dental care.
6. The anti-mortem evidential materials and data are standards for comparison. They are seized observing all the legal formalities and kept in a way to maintain their identity, integrity, authenticity and continuity of chain of custody.
7. Submit the collected questioned and standard (anti-mortem) data to the Forensic Odontologist. Associate the concerned family dentist with the forensic odontologist to evaluate and compare the data from two sources, if possible.
8. Obtain the report and submit it to the court when the identity of the person is established.

35.5 FORENSIC ODONTOLOGIST

An ideal Forensic Odontologist (also known as forensic Dentist) is a person:

4. See chapter 23 of this book.

1. Who is educated in dentistry, has been trained in Forensic Odontology, is engaged in the case and research work in Forensic Odontology or related subject(s) and has published papers to his credit.
2. Who has been initiated to the speciality through training and attachment for considerable time to a renowned and experienced Forensic Odontologist in a respected dental institution where Forensic Odontology work is routine.
3. Who has acquired ample practical experience in Forensic Odontology during his attachment period, and later.
4. Who is interested in the field and takes up the professional challenges seriously.
5. Who has no preconceived idea about the outcome of the examination. He starts examination with open mind. Collects both positive and negative data and goes by the preponderance of the data.
6. Who furnishes his reports on the basis of adequate data, for which minimal is fixed by the professional community.
7. Who informs the court about the tools and techniques used and indicate the salient observations of the work.
8. Who generates the data using the latest proven and well-established tools and techniques, being used and accepted by fellow professional in the field.
9. Who abides by the standards recognised (or prescribed) by his professional fraternity.
10. who does not accept the dictates of intuition, hunch or supernatural revelations.
11. Who remains a man of science. His inferences flow from the observations he made during the examination.
12. Who has no enemy to punish and no friends to save.
13. Who is immune to temptation, influence and bias.
14. Who is aware of the Conformational Syndrome[5], considers it and avoids it scrupulously.
15. Who has a liaison with Forensic Pathologists, Forensic Anthropologists and fellow Forensic Odontologists. He consults them in all refractory and borderline cases.
16. Who writes a report in simple and easily intelligible language not amenable to double meaning or ambiguity.
17. Who writes clear and unambiguous conclusion fall in one of the following categories:
    - Positive (±)
    - Probable (±)
    - No report data insufficient!

35.5.1 The Expertise

Forensic Odontology can be divided into following categories for the convenience of study and evaluations:

1. Evaluation of dentition, dentures, teeth
2. Identification of bite marks and their linkage with the biter.
3. Determination of age from the study of teeth
4. Developing the subject's Profile.

5. It is conscious or unconscious desire of the expert, to prove what has been suggested to him by the referral authorities.

35.5.2 Evaluations

Forensic Odontologist is doing a Yeoman's job in the identification of persons from corpses, skeletal remains and bones. The exhibits may be of drowned, burned, dismembered bodies found in varied situations, including those in mass murders and mass disasters like Tsunami, fires, or buried skeletons (or parts thereof), bodies thrown in wells or pits, bodies or their parts from abandoned bodies in deserted places like ravines, jungles, deserts.

The science has come a long way since it started identifying skeleton remains. Today it is one of the important major tasks of the Forensic Odontologist. He often succeeds to give definite identification of the deceased if the ante-mortem dental data of the possible suspect(s) is available. Dentition perhaps provides the most frequent and certain type of evidence to identify skeletal remains. The process is laborious but highly rewarding. The Forensic Odontologist carries out the following drill:

1. Examines, photographs, X-rays, sketches, prepares casts/dentures/transparencies and takes detailed notes of the questioned evidence: dentition, tooth or combination of teeth.
2. Prepares positive casts from the negative casts procured from the dentist to compare the positive casts with the questioned dentition.
3. He prepares transparencies for comparison. Superimposition comparisons are effective to prove match or non-match of the dentition.
4. He generates complete dental profile chart of the questioned dentition and includes all the identifying features of each tooth, the pattern of the teeth and of the dentition as a whole.
5. He procures the ante-mortem dental data (Standard data) of the suspect(s). It includes written notes, sketches, dental casts, dentures (partial or complete, experimental or final) and details of the dental work done, with dates from the subject's dentist via the police.

   The SIT chief obtains the dental data from the subject's dentist with or without the help of a Forensic Odontologist.
6. Compares the prepared dental profile from the available dentition and other generated data with the data from the dentist's record, tooth-by-tooth, corresponding combinations of teeth and dentition. The preponderance of the alike or non-alike features decides identity or exclusion of the suspected person.
7. He consults the subject's family dentist and other specialists in the field, whenever possible. This is a **"must"** in refractory and borderline cases.
8. He accounts for oddities, if any.
9. Writes a lucid, unambiguous and intelligible report and conclusions about his finding.

There is no fixed number of matching points in Forensic Odontology identifications. The nature of the evidence is such that even one malformed or broken or repaired tooth may provide clinching evidence. It is equally possible that the whole dentition may not provide adequate evidence to furnish definite opinion. The latter proposition is rather rare.

Identification of a person via dentition and teeth has proved useful in a variety of situations:

35.5.2.1 Confirmation of Death

Confirmation of death is often needed to settle property matters and to meet the ends of justice in cases of fugitives from the law. A dead person is beyond law. Hitler's case of confirmation of his death is an outstanding international example.

Adolf Hitler was the chief warlord of the IInd World War. Millions of people died in that war. Ultimately, the Allies defeated him. They thought Hitler was responsible for the Genocide of more than six million persons. They wanted to try him for the war crimes. However, he was not available! Some thought that he had run away. Other said he has committed suicide.

According to the suicide theory, Adolf Hitler committed suicide along with his wife Eva Braun On 30 April 1945. He ingested a cyanide capsule and shot himself in the right temple with his pistol. The bodies of both the persons were later (as per his instructions) burnt with petrol just outside his bunker. The fire did not consume the bodies completely. The unburnt parts, therefore, were buried in a nearby jungle.

The staff of Hitler spread the news of suicide. However, not many believed them. It was rumoured that he was in hiding and might strike back in due course. The Allies wanted proof of his death.

Russian forces had reached Hitler's bunker first. They investigated. The bodies were exhumed. The dental record of Hitler was procured from his dentist. It was compared with the denture recovered from the burnt body. There was ample evidence to fix the identity of Hitler from the remains. Specifically, the clinching evidence was:

- *A gold bridge with porcelain facets in the upper jaw*
- *Two bridges in the lower jaw*
- *Presence and absence of teeth in the lower jaw*
- *The dentist provided the corresponding evidence from his records.*

The evidence finally made the Russians believe that "Hitler is dead". It took some more time for the rest of the Allies to believe the same. (CH)

35.5.2.2 Identifications in Mass Disasters

Mass disasters like earthquakes, aeroplane accidents, train accidents, fires in congested cities take a heavy toll of life. Quite a few persons are mutilated so much that they cannot be identified. Forensic Odontology comes handy to identify them if they have dental record.

Tsunami waves of 2005 killed thousands of persons in Asia. More than 800 odd victims were extensively disfigured, mutilated and dismembered. Their kith and kin could not identify them. Forensic Odontologist identified 90% of the disfigured bodies through dentitions and their records with the dentists. (CH)

35.5.2.3 Mass Murders

Terrorists all over the world commit mass murders. They use various modes: bombing, sabotage (exploding Kanishka aeroplane!), arson, shooting sprees, gas chambers, and rail and road accidents to commit mass murders. In mass murders often some of the bodies are mutilated beyond normal recognition. Forensic Odontology provides the needed identification by identifying the dentition of the mutilated victim.

Terrorists used novel technique to blast the World Trade Centre's twin towers in USA. No explosive of the usual type was used. Instead, two aeroplanes, fully fuelled struck the towers. Huge fire started and the building collapsed. 2996 persons were killed. More than 6,000 others were wounded.

973 bodies were highly disfigured and could not be identified in the usual way. Forensic Odontology could identify 20% of 973 bodies. (CH)

In mass murders and mass disasters, the number of police personnel, volunteers, and hired labour and of dental specialists is very important. The team leader coordinates the work of all the persons. The working drill takes the following pattern:

1. Provide medical assistance (First Aid) to the injured and send him to the nearest hospital without delay.
2. When a dead body is recovered, he takes the following action:
   - Gets death confirmed from a doctor.
   - Gives it a serial number for identification, which should continue until the body is claimed by the relatives or it is disposed off otherwise.
   - Records Portrait Parle of the deceased.
   - Wraps the body in a white sheet and place it in a safe place where the relative can see and identify the body.
   - Ensures correct identification of the body and records the identifying data.
   - Hands over the unidentified bodies to the Forensic Odontologist's team.
   - Provides the team with details of the possible persons with dental data whenever possible.
   - Preserves the dead bodies in cold rooms until identified or ordered disposal by the competent authority.

35.5.2.4 Mental patient

Sometimes the mental patients escape from mental asylums. They, sometimes, die incognito. There bodies or skeleton are discovered long after death. They are often identified through their dentitions.

Some years ago an inmate of a mental hospital escaped from the hospital. Extensive searches in the nearby localities were made but he could not be located.

After about a year, the skeleton of a person was found in a jungle. The torn clothes found around the skeleton could be identified to be those of the inmates of the mental hospital. It was believed that the skeleton was that of a mental patient from the hospital. However, during the last few years quite a few inmates had escaped. Therefore, the identity of the person whose skeletal remains were available had to be established on firm grounds.

The last escapee had a dental record in the hospital. It was compared with the dentition found on the skeleton. It matched. The identity of the deceased was established.

The identity was confirmed further by comparing the vertebra of the skeleton with the radiograph of the vertebra taken in the hospital earlier. (CH)

35.5.2.5 Miscellaneous

Forensic Odontology has proved useful in the dissemination of justice in many other ways. It helps to:

1. Identify persons who have lost their memories,
2. Determine the age of a person,
3. Ascertain the social background of a person,
4. Determine the race, and
5. Identify the teeth marks on non-human surface.

In a case of murder, there were scratch teeth marks on the butt of the firearm of a suspect. Forensic Odontologist identified them to be the teeth marks of the murder victim. The evidence linked the suspect with the murder. (CH)

35.6 AGE DETERMINATIONS

The determination of age of a person: alive, dead or of skeletal remains is an important ontological task. It helps in:

1. Profiling a person from dental remains,
2. Elimination of possible victims in mass murders or disasters,
3. Exclusion (or inclusion) of a missing person in the list of dead persons,
4. Determination of major/minor status of an offender.

The following factors help to determine the age of a person:

- Eruptions of teeth
- Developments of teeth
- Deterioration of the denture/teeth

Some aspects of these factors are discussed briefly here.

35.6.1 Eruptions of Teeth

The determination of the age of a person from the dentition is based upon eruption of teeth, which starts at the age of six months and continues up to the age of 21 years, with some individual variations. They, therefore, do not permit determination of the exact age of the person from teeth eruption. An idea of an approximate can be gathered from the tables.

Table 35.3

Eruption Schedule of Milk Teeth

S.No	Tooth	Age of appearance (in months)	
		Lower jaw	Upper jaw
1.	Central Incisor	6	7-8
2.	Side Incisor	7	9
3.	I Molar	12	14
4.	Canine	16	18
5.	II Molar	20	24

Permanent teeth replace them in due course. They pushed out the milk teeth and take their place. The eruption period of the permanent teeth in the adolescent (and youth) is given in the following table 4:

Table 35.4

Eruption Schedule of Permanent Teeth

S.No	Tooth	Age of appearance (in years)	
		Lower jaw	Upper jaw
1.	Central Incisor	6-7	7-8
2.	Internal incisor	7-8	8-9
3.	Canine	9-10	11-12
4.	I Premolar	10-12	10-11
5.	II Premolar	11-12	10-12
6.	I Molar	6-7	6-7
7.	II molar	11-13	12-13
8.	III molar	17-21	17-21

35.6.2 Teeth Development

Teeth development has extensively been used to determine the age of adults from twenty-one years of age onwards. Numerous factors in the development of teeth morphology help to estimate the age of live or dead persons; or, their skeletal remains. They are highly complex. With proper inputs, however, Forensic Odontology can provide a close estimate of the age. Details of the tools and techniques used by the specialists are too technical to be discussed in this discourse. The main modes are, however, mentioned below:

1. Completion of dentition
2. Completion stage of roots (erupted teeth!)
3. Rate of formation of enamel
4. Attrition of the crown
5. Formation of cementum
6. Transparency of root dentin
7. Root surface re-sorption
8. Discolouration and staining of teeth
9. Changes in the chemical composition of teeth

Forensic Odontologist, given the time and can arrive at close estimates.

35.6.3 Age of Foetus and Infant

The Forensic Odontologist faces the problem of the determination of age of a foetus or infant in cases of adultery and abortions.

The age of the foetus or infant can be estimated with great accuracy. The teeth formation process (mineralisation) starts during appropriate stages of foetal development. Primary (baby) teeth start to form between the sixth and eighth week of prenatal development, and permanent teeth begin to form in the twentieth week. The age determination is facilitated by:

1. Histological
2. Radiography
3. Detection of neonatal lines, present on deciduous and permanent teeth.

Using these and other methods (Stack's Regression lines!) a competent Forensic Odontologist can give the age of the foetus.

35.7 BITE MARKS[6]

Bite marks, as the name indicates, are 3-dimensional impressions or 2-dimensional surface prints, which are created by the bites of human/animal/beasts. The marks may be on food articles, chewing gum or the human body, wood, leather or on other surfaces. They may also create sliding marks.

6. British Association for Forensic Odontology has issued comprehensive guidelines for bite mark investigation and analysis.

The identification that the given marks are human bite marks is often possible as they are in the form of an arch corresponding to the dentition arch. That they are of one or more persons can also be determined in most of the cases. However, linking the culprit and the bite marks *inter se* is not always possible from Forensic Odontology because of many variables, including the topography of the surface and the mechanics of the biting process and the force used for their creation. However as saliva is deposited along with the marks, DNA analysis of saliva identifies the biter. In USA, in some case, where the biter was identified via odontology were found to be wrong identifications via DNA profiling. If DNA material is found along the mark, it is used for identification of the biter.

> *Roy Brown, of New York State, USA, was convicted for murder mainly on the basis of bite marks which, according to the Forensic Odontologist had come from Roy Brown. Later, on comparison of DNA profile of the saliva deposited around the bite marks with the DNA profile of Roy brown, it was found that the DNA profiles differed. The convicted person was acquitted! (CH)*

The linkage of the biter to the bite marks is important in almost all cases of sex crime, murders and other violent crimes hence they are processed with extra care. The processing, in all cases, offers a serious challenge to the investigating officer who should pass it on to the Forensic Odontologist.

The shapes, sizes and orientations of the marks, individually (one tooth) or collectively (two or more teeth) are highly characteristic. They permit the identification of human bite and link them to the biter.

The above case indicates that to error is possible. But can we afford, in Forensics, such errors which affect the lives and liberties of a person?

Bite Marks occur quite frequently in sex crimes including sex murders. They may also occur in other crimes like theft, scuffle, fighting, assault, child abuse and homicide. A person may also create false bite marks to accuse another person of assault. Dog bites, beast bites and animal bite also come up for investigation sometimes.

Bite marks identification is the real tough bite for the Forensic Odontologist. There are so many variables involved in the biting process that the replication of bite marks of the same person on the same strata is difficult to achieve.

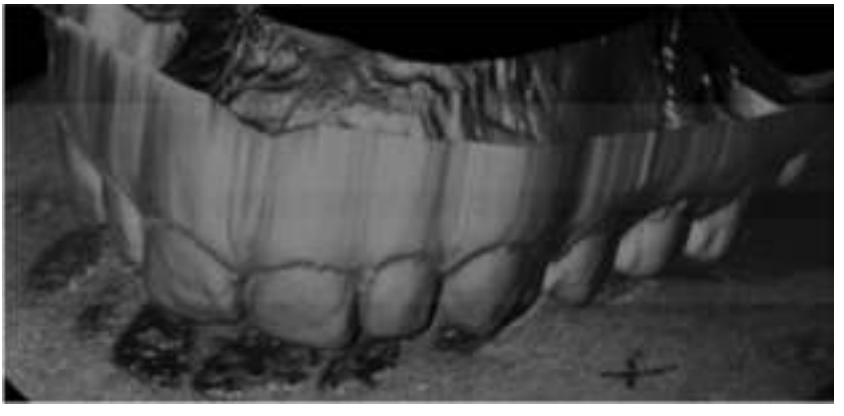

Fig. 35.3

Do the bite marks and the teeth correspond? exceptional correspondence!

Biggar sex-murder case was a blind murder that took place in a small town of Scotland in 1967. The body of a fifteen-year-old girl, Linda Peacock was found in a cemetery of the town. The girl was found not only strangled to death but was also beaten and bitten. The only substantial evidence found on the person of the deceased or at the scene was a fairly well-defined bite mark on the breast of the deceased. The police took the body to a forensic Odontologist. He, after careful observations, found that the bite marks on the deceased had certain peculiarities which could fix the source of the bite mark. He collected the evidence through photographs (numerous) and cast. The police investigations revealed that the deceased was the girl from a nearby village and nobody had seen her in the town before except on that day.

The police, after taking all the aspects of the case into consideration, came to the conclusion that the girl had been brought to the place by someone who killed her later. They also felt that the person was probably an inmate from the detention house or a student of the local college.

There were only teeth marks to identify and pin the crime on the culprit. They decided to take and took dental casts of all the inmates of the detention house and students of the college.

There were thus dental casts from about four hundred persons. The Odontologists started the examination of the casts and their comparison with the bite marks.

Most of them were eliminated easily; a few needed more careful examination for elimination. Ultimately, only five casts were left for finalising the identity or non-identity of the questioned marks.

The expert had found a very peculiar feature in one of the teeth in the bite mark. There were two pits on the tooth due to a rare disease. These pits became the hallmark for the identification of the culprit. Similar pits were not found in the corresponding tooth in any other teeth of any of the four hundred persons except in the corresponding tooth of Gordon Hay.

A galaxy of British dentists and forensic pathologists including Professor Keith Simpson, studied the casts and decided the identity issue. They could finally come to the agreed conclusion that the bite marks on the person of the deceased had come from Gordon Hay, an inmate of the detention home and from no other person.

Some corroboratory evidence was also found.

It was the first case in UK, in which the main evidence was the bite mark only. The scientists therefore took extra precautions. The exhibits along with the opinion were sent to some experts in Scandinavian countries. They also, largely, agreed with the findings and furnished general support.

Gordon Hay's appeal to the superior court was rejected. (CH)

35.7.1 Bite Mark Variables

The main variables affecting the character of bite marks are:

1. The number, orientation, shape, size and sharpness of the teeth involved.
2. Elasticity of the skin
3. Variations in the bite marks of the same person

Fig. 35.4

Bite marks 1 and 2 from the same set of teeth. Duplicates never exactly alike

4. The mental and emotional state of the biter
5. The force and speed with which the victim was bitten.
6. The bite site.
7. The resistance offered by the victim.
8. The movement of the victim or the biter (of the bitten body parts) while biting.
9. The mutilation of the mark.
10. Natural changes in the marks with the passage of time.

A serious reason for incorrect opinions is Conformational Syndrome the Forensic Odontologists. It is the subconscious tendency of most of the experts (even of other expertise) to conform to the views of the investigator, first impression or his personal hunch. Expert's unconscious bias and ego "to prove" the given proposition is often responsible for the wrong opinion.

In view of so many variables, it is advisable to:

1. Engage only an ace Forensic Odontologist.
2. Use only the latest technology.
3. Consult/discuss the finding with another seasoned expert before the report is furnished.

Ted Bundy was a serial killer in USA. He had killed many a female in rape-cum murder assaults. In the last case he killed two women, injured three more. One of the victims, Lisa Levy was raped, battered and bitten.

She had two bite marks; one on the neck and the other on her left buttock. The latter was quite clear. It was properly photographed and the skin bearing the mark was excised and collected as crime exhibits.

The police had to get the impressions of the dentition of Ted Bundy through court orders as he refused to give impressions[7]. A Forensic Odontologist took numerous photographs of the front teeth from both the jaws. He found uneven teeth pattern which could help to identify the bite marks.

The Forensic Odontologist carried out the examination and comparison. He found ample evidence to show that the bite marks on Lisa Levy had come from the teeth of Ted Bundy.

- *The structural alignment corresponded.*
- *Chipping was similar and on the corresponding teeth.*
- *The size and structures of the bicuspids of the corresponding teeth were alike.*

The expert prepared the transparency to scale, and superimposed the same over the crime mark. The superimposition was quite impressive.

7. The police feared that Ted Bundy might grind his teeth to change the pattern. So, they kept a watch on him.

The expert showed that he had carried out a number of test matches to ascertain the validity of his tools and techniques. He had found them reliable.

The court called another far more experienced Forensic Odontologist. He confirmed the findings.

The court sentenced Ted Bundy to electric chair; more or less on Bite Mark evidence alone. (CH)

The identification of the biter from bite marks, in spite of a lot of progress in Forensic Odontology, still remains highly subjective. Computers have improved the situation; still it has remained a serious challenge to the specialist.

35.7.2 Identifying Features

In spite of the numerous variables (*supra*) bite marks are identified day in and day out. The identifying features are:

1. **The dentition arch**: it is usually 3 to 5 cm, creating corresponding arched shaped impression. It identifies that it is human bite and also help to eliminate some suspects.
2. **Presence of odd unique tooth:** (teeth); the unique teeth mark permit identification of the biter. In Biggar Murder case an odd feature on one tooth alone identified the biter.
3. **The layout, orientation, shapes and sizes:** of the teeth; leave a pattern of oddities in the bite marks which permit the identification of the biter.
4. **The interspaces and angularities of the teeth *inter se*:** they vary from one person to another. These variations are reflected in the bite marks and help to identify the biter.
5. **Wear patterns:** of teeth help identification
6. **The missing teeth**: their number, position, size are registered in the bite marks. They allow easy eliminations and help to identify the biter.
7. **The presence of broken/damaged tooth/teeth**: they often offer individualising evidence.in the identification of bite marks.
8. **The presence of additional/misaligned teeth (tooth);** they leave characteristic features in the bite marks, which help to identify the biter.
9. **Repaired, restored or artificial teeth**; they give individualistic patterns. They are highly significant in the identification of the bite marks.
10. **The deposition of saliva;** it takes place in and around the bite marks in all bite marks. DNA profile fixes the identity of the biter irrefutably.

DNA profiling of saliva, on bite marks, is preventing many miscarriages of justice which had been taking place due to incorrect linkages through bite marks (Roy brown case: *supra*). However, there are situations where saliva or its stain is not available. For example, bodies recovered from water or exposed to heavy rain may not retain saliva. Clever criminal may wash off the saliva and its stains or may substitute it with that of the victim, or some third person or even of animal (dog!). The Forensic Odontologist therefore, is indispensable in such cases.

The identification of the biter from bite marks, in spite of a lot of progress in Forensic Odontology, still remains highly subjective; though computers have improved the situation.

35.7.3 Bite Marks Collection

The Forensic Odontologist is the main person to locate, collect and preserve the marks for evaluation with the help of the investigator and the medico-legal expert. In the handling of the evidence, he has to:

1. Scrutinise whether the bite marks are of human or animal origin.
2. Collect saliva swabs from the bite marks.
3. Photograph the marks. Use high quality digital camera.
4. Departmental photographer often helps to:
   - Photograph the bite mark as it is found at the site, keeping in mind the postural and photographic distortions. Take additional photographs for postural correction and curved surfaces.
   - Take repeat photographs, placing two scales, at right angle to each other together, along with the case data chit in each shot.
   - Take additional similar shots at intervals of one day each until the bite marks fade. The bite marks change colour and there is also some change in the shape and size of the marks with the passage of time.
   - Take 1:1 transparencies and photographs for comparisons.
   - Takes 3 D photographs in those cases where the bite marks have depth and skin is torn.
5. Draw sketch of the bite marks as faithful to the original as possible.
6. Trace the bite marks on a transparent plastic sheet.
7. Take casts of the bite marks if they have appreciable depth.
8. Collect the skin (dermis and subcutaneous tissues) carrying the bite marks, if the bite marks are on a dead person.
9. Collect all the photographs taken by the medico-legal expert in the mortuary, by the IO at the Scene and those taken by the media people.

35.7.4 Action

The bite marks are usually on the body of the victim. The investigator notices them at the time of the examination of the body; and if the victim is dead, at the time of inquest. The marks may be easily visible, indistinct or covered with blood or clothes. Proper location, collection and preservation of the marks for further evaluation may need the help of the medico-legal expert and/or the Forensic Odontologist. In all cases of bite marks, he must requisition the help of these specialists.

35.7.4.1 Sites

The bite sites, in forensic situations, are found on various parts of the body:

1. **In sex or sex-murder cases;** the common sites are the cheeks, the breasts, the neck, shoulders, the arms, the buttocks of the females.
2. **In homosexual cases;** the bites are found on the back, shoulders and cheeks.
3. **In child abuse cases;** the most abused sites for bites are the cheeks and the arms.
4. **In defence bite cases;** the common sites are the hands and the arms. They are usually deep (3-dimensional) and they may also be sliding marks.
5. **In false self-inflicted bite marks; the** usual **bite mark sites are** arms, thighs, breasts. On asking, an accomplice may inflict bites on cheeks, breasts and/or buttocks.

35.7.4.2 Quality

The quality of the bite marks is often poor. They are not clear. The investigator may fail to identify whether the marks are bite marks or bruises in some cases. The rule of the thumb for their identification is that they are in the form of an arc of 3 to 5 cm. If the investigator finds such an arc; a Forensic Odontologist is asked to examine. He will ascertain its nature. In any case, whenever there is doubt about the nature of the mark, his expertise is utilised.

35.7.4.3 Collection of Bite Marks

It is better to collect the bite marks evidence is at the time of post-mortem examination if the victim is dead; or, at the time of medico-legal examination when the victim is alive. Forensic Odontologist, however, must participate in the collection of the evidence. The action protocol is to:

1. Ascertain if the marks are bite marks.
2. Ascertain if they are of human or animal origin.
3. Collect saliva swabs from the bite marks.
4. Photograph the bite mark as it is found at the site keeping in mind the postural and photographic distortions. Additional photographs may be taken for postural correction and curved surfaces.
5. Photograph them before and after cleaning.
6. Take repeat photographs. Include two scales, placed at a right angle to each other together and parallel to the lens. Also place a case data chit in each shot.
7. Take additional similar shots at intervals of one day each till the bite marks fade. The bite marks change colour and there is also some change in the shape and size of the marks with the passage of time.
8. Prepare 1:1 transparencies and photographs for comparisons.
9. Prepare a sketch of the bite marks as faithful to the original as possible.
10. Prepare a tracing of the bite marks on a transparent sheet.
11. Prepare casts of the bite marks if they have appreciable depth.
12. Take 3 D photographs in those cases where the bite marks have depth and skin is torn.
13. Collect the skin (dermis and subcutaneous tissues) carrying the bite marks if the victim is dead.
14. Collect all the photographs taken by the medico-legal expert in the mortuary or those taken at the scene.

Forensic Odontologist or a competent dentist collects the standard data for comparison from the suspect(s). The Odontologist follows a drill to:

1. Examine the suspect in the presence of a witness(es).
2. Collect saliva sample from the suspect.
3. Check the suspect for dental treatment and notes down the changes, in chronological order, if possible.
4. Carry out complete dental charting of the biting teeth.
5. Record the occlusions and surface characteristics of the biting teeth.

6. Take a number of photographs of teeth of the suspect from various angles.
7. Prepare 1 : 1 transparencies from the photographs for superimposition.
8. Prepare casts of both the dentitions preferably in Dental mass.
9. Obtain bite marks) on soft materials (like chewing gum) for preliminary check.
10. Obtains similar sliding marks on a hard object like wooden piece, plastic or metallic (Lead, Aluminium!) sheet, if the questioned teeth marks are in sliding form.

The Forensic Odontologist ensures identity, integrity, authenticity and continuity of the chain of possession.

35.7.5 Bite mark Identification Process

The Forensic Odontologist examines and compares the questioned and test marks without any preconceived ideas about the match, without bias and without any pressure. He takes into accounts the total evidence (distortions, movement and surface topography). The Forensic Odontologist evaluation is:

1. Assesses the factors which cause distortions in the bite marks
   - Bite site
   - Position of the assailant
   - Relative movement of the teeth and the bitten surface
   - Intervening clothes, if any, through which the victim has been bitten
   - Resistance of the victim
2. Examines, measures, and compare the dentition arch with the bite marks arch in respect of size, orientation and shape.
3. checks the correspondence (presence or absence) of teeth in the corresponding locations.
4. Compares the sizes, shapes and orientation of the standard and questioned marks.
5. Studies and compares the *inter se* gap pattern among the teeth.
6. Compares the surface characteristics of the teeth present in the two types of marks.
7. Locates and compares peculiarities in the topography of individual tooth mark or in a combination of teeth.
8. Uses clear and unambiguous 1 : 1 transparencies of the test marks for superimposition on the 1 : 1 photograph of the bite marks to show correct match.
9. Uses computers to show correspondence (or otherwise) through overlays of the photographs from the dentition and the bite marks.
10. Uses 3-D photography of the bite and test marks for better appreciation of the evidence.
11. Takes cast the denture of the suspect for better appreciation/ demonstration of the evidence.
12. Locates, assesses and accounts for the non-corresponding features in the marks.
13. Finalises the report after consultations/discussions with other experts.

35.8 REPORT

The Forensic Odontologist writes a concise, precise yet comprehensive report on the departmental report form. He mentions tools and techniques used, observations made, data generated and logical inferences out-flowing from the observations and data. He explains the ever-existing negative evidence.

His conclusions are clear and give one interpretation only, as already mentioned above.

35.8.1 Recent Advances

Forensic Odontology is making long strides to make it more useful in the dissemination of justice. Some of the major thrusts areas are:

35.8.1.1 Dentition Library[8]

Digitised dental record is being stored in computers like fingerprint records. The dentitions are being classified and the data is collected in digital form. Whenever there is a reference to the library with the dentition itself or with data about the questioned dentition recorded in the same way as done for the library, the data can indicate the possible identity of person(s) to whom the dentition belonged. In simple words, the dentition reveals the identity of the person. The building up of the data is yet in the initial stages, in USA. There is no corresponding project in India today.

35.8.1.2 DNA Profiling

Teeth carry DNA profiling material with them in the root canal pulp and it is retained for a long time even after death. It can be used for the identity of a person. If a broken tooth is left on the person of the victim or at the scene it can identify or excludes the identity of the suspect owner of the tooth irrefutably.

Mitochondrial DNA is found in the teeth bones. It can be utilised to identify the person from the skeletal remains of the body even after thousands of years.

Further, teeth of live person are always smeared with saliva. They deposit it on, around or in the bite mark. Saliva provides material for DNA profiling.

Pulp in the root canal is a useful source for DNA profiling and it can be used even after years for the purpose.

35.8.1.3 Induction of 3-D Photography[9]

Bite marks are sometimes 3-dimensional. They can be better appreciated and evaluated if they are recorded through 3-D photography. It has proved a valuable innovation in those cases where a Forensic Odontologist is not able to examine the bite marks in situ. 3-D photography is also a more effective way of presentation of evidence in courts. The judges can appreciate the evidence better.

35.8.1.4 Computers in Forensic Odontology[10]

The use of computers in the evaluation and presentation of Forensic Odontology evidence has facilitated the task of the Forensic Odontologist in many ways. Some of the important uses of computer in Forensic Odontology is being utilised are:

8. http://dgrc.org/dgo last accessed on November 2019.
9. Lewis, C. *et al.* 2004. Journal of Forensic Identifications, 52(4), 185 and Jour. For. Sci. 2005, 50(1).
10. Jour. For. Sci. 2002, 47(2), 354 (also see references in 12 above).

1. Dentition record Library
2. Automated search of dental data in dentition library, corresponding to the data generated from a dentition.
3. Identification of the questioned dentition through automated comparison of the data in library computers through Odonto Search software. The software has almost finished the subjective element in dentition data comparison. It gives the identification itself.
4. Creation of overlays of dental casts and their comparison with the photographs of the bite marks.
5. The bite marks photographs are often inadequate. They are being improved through computer enhancement and other software.

35.9 LIMITATIONS

Forensic Odontology is a new and emerging science in India. It is being used only in very few cases. There are reasons for its limited use.

1. Forensic Odontology is not known to many, even educate persons. Hence, they are not able to appreciate the evidence.
2. There are very few institutions, which teach, train, do research work or provide expertise in Forensic Odontology to the needy.
3. The expertise requires a lot of legwork on the part of police. There may be many suspects. The dental data may be with different dentists. He has not only to locate the suspects but has to go after the dentists of the area. It is time-consuming task, each time! They tend to avoid it whenever possible.
4. Indians are not dentist savvy. Nor most of the dentists maintain a proper dental record of their patients. Often the long trails (if the investigator takes up) end in fiasco! No standard data is found.
5. Bite mark identification via dentition is highly subjective. It involves so many variables that if the scientist deviates even slightly from the scientific path he meets his Waterloo. In short, eternal vigilance, expertise of high order, consultations with other professionals and ages of experience are needed for reliable results. Undoubtedly, it is a tall order for anyone.
6. Bite marks are fickle. They not only change with time but for a host of other reasons they are often variable. Each case of bite marks is a challenge to the scientist and a research project in itself.
7. Limitations of time and resources also limit the quality of the findings.

The agony of wrong identifications, in most of the bite mark cases, is alleviated by DNA profiling. However, in cases where no saliva or body cells are available identification via dentition is the only media.

35.10 ADDITIONAL READINGS

1. Averull, De. *Manual of Forensic Odontology.* American Society of Forensic Odontology, USA.
2. Keiser-Nelson, S. *Person Identification by means of Teeth.* John Wright and Sons. Bristol, UK.

CHAPTER 36

FORENSIC ENTOMOLOGY

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Fig. 36.1

Necrophagous carrion action

36.1 GENERAL

Forensic Entomology is the application of knowledge relating to arthropods in the dissemination of justice. It mostly involves insect-related evidence, which forms evidentiary clues in criminal (or civil) situations. The utility of the knowledge and its application had been known now for centuries. However, the imposing name "Forensic Entomology" and its extended uses were not prevalent.

Forensic Entomology, as a discipline, started in right earnest only in the 1970s. The scientists started using the knowledge about the necrophagous carrion action of insects on the dead bodies and rotting flesh to determine the time of death. It has become a respected part of forensic pathology. Researches added new dimensions to the expertise. Thus, Forensic Entomology is in fact "old wine in new bottles", with enlarged contents and with better tools and techniques. They have increased the confidence level in the evidence; covering a wider field and attracting more clientele, in consonance with similar developments in other fields of Forensics.

Incidentally, it is one of the oldest branches of Forensics. The first case in which it was used to make the culprit confess was in the thirteenth century.

> *The investigator of the case must have been a genius who used insects to identify the weapon of murder in the thirteenth century in China. The weapon, in turn, identified the murderer.*
>
> *The investigator was a Chinese magistrate. There was a murder in the rural area on a farm. A number of farm labourers had been engaged to harvest the paddy crop. One of them had murdered the victim who carried a number of sickle wounds.*
>
> *The magistrate investigator collected the sickles from all the workers. He placed them in the warm sunshine. Soon after, one of the sickles attracted flies, presumably due to the blood sticking to the sickle. As there was no blood on other sickles, flies did not visit them. The owner of the sickle was hauled up for murder, on the evidence provided by the flies*[1]*, he confessed to the crime.* (CH)

36.2 NATURE

Forensic Entomology is the scientific study of the invasion of the succession pattern of arthropods including insects, arachnids, centipedes, millipedes, and crustaceans with their developmental stages found on the decomposed cadavers found during legal investigations. It is the application and study of insects and other arthropod biology to criminal matters.

It is primarily associated with death investigations mainly to find the time of death; also called **P**ost-**M**ortem **I**nterval (PMI). However, it is also used to detect drugs and poisons, determine the location of an incident, and find the presence and time of the infliction of wounds.

In other words, Forensic Entomology utilises the entomological evidence, of arthropods, their life cycle, their habitat specificity, their seasonal emergence, their fragments and remains or the chemical content of the body remains, mainly for the purposes of law.

36.2.1 Classification

Forensic Entomology is classified into the following categories:

- Medico-legal Forensic Entomology
- General Forensic Entomology
- Urban Forensic Entomology
- Stored food-stuff Forensic Entomology.

1. Song Chi. 1247. From Wikipedia "*Forensic Entomology" Internet.*

36.2.1.1 Medico-legal Forensic Entomology

The Forensic Entomologists study the nature of the arthropods, their location in the body part, life cycles, faunal succession and the nature and composition of their remains at the scenes of murder, suicide, rape, physical abuse and drug trafficking. The study enables the Forensic experts in many ways, to answer various questions, which may come up during their medico-legal examinations. For example, it helps them to find out:

- The time of death, also called **P**ost-**M**ortem **I**nterval (PMI).
- The negligence shown to a child or incapacitated person.
- The exact site of the crime scene as many insects exhibit a degree of endemism[2]
- The season in which the victim killed/died
- Drug identification from the remains of the insects. The drug may have caused the death. The sub-branch is called **entomotoxicology.**

In India, medico-legal Forensic Entomology is utilised mostly to determine the post-mortem interval (**PMI**) but it is hoped that in the coming years its full potential is utilized to solve crimes.

36.2.1.2 General Forensic Entomology

General Forensic Entomology is based upon the fact that the arthropods vary tremendously with varying temperature, humidity, season and location. They have unique habitat characteristics. Further, the variety of species is legion (in millions)! Given the right tools and techniques and expertise, they can be linked to specific sites, individual flora and fauna, and to specific seasons and habitat. Thus, *inter alia,* they help to link the criminal with the crime, with the victim, with the changing scenes, with the weapon of offence. The branch plays important role in the dissemination of justice. Specifically, it helps to:

- Ascertain the place(s) where the corpse had been shifted from time to time from the original crime scene.
- Detect/identify the poison(s) used to kill the victim from the remains of insects.
- Find the area of origin of narcotics of plant origin in the narcotic material with that of the suspected site, which indicates the crime scene.
- Discriminate the real crime scene by comparing the fauna of the real crime scene and that on.
- Identify the victim from the sucked blood residues left by the fauna.

36.2.1.3 Urban Forensic Entomology

Urban Forensic Entomology is concerned mainly with the urban pest fauna which infests the buildings (kitchen and bathrooms), gardens. The pests are becoming a serious menace with increasing urbanisation. The fauna, mostly insects, feed on the organic waste, dead flesh and on the living being. They spread diseases and cause economic problems. Their evidence, both in civil and criminal cases, plays a crucial role; but the public being unaware, this field has so far remained unexploited in India.

Urban forensic Entomology is also concerned with appropriateness of certain pesticides and their applications to protect stored products, in order to safeguard the users of the food products.

2. They are location centred. They occur only at certain places/environment.

36.2.1.4 Food-Storage Forensic Entomology

Stored foodstuffs are often infested by insects which cause a substantial loss to the owner; the more serious problem, however, occurs when the owner pushes the infested products to an unsuspecting consumer, spreading diseases and even death. Forensic entomologist in such can provide expert help both in criminal and civil trials involving spoiled foodstuff. The speciality is yet to make its mark in India.

36.3 FORENSIC ENTOMOLOGICAL ARTHROPODS[3]

36.3.1 Arthropods

The number and nature of arthropods is legion. We discuss only those, which are encountered in Forensic Entomology. Flies and beetles are frequently involved for the evidence.

Forensic Entomology is mostly concerned with **insect** arthropods, more specifically with flies and beetles. Occasionally, scorpion or spider evidence may also figure but it is rare. The discussion in this chapter is, therefore, limited to insects only, especially to those insects which are frequently involved in their various avatars in evidential situations. They are mostly necrophagous carrion arthropods (insects). They eat flesh and other rotten organic matter.

Each of these insects has a large number of sub-types, which vary with varying habitat and environment. Temperatures and humidity are important determiners. They are thus site-specific, time-specific and environment-specific clues that help the Forensic Entomologist to link them with the place of their origin, the season and the time at which they appear on a corpse where they are found.

The nature of Forensic Entomological evidence is varied and complicated. Relevant evidence is discussed under the following categories:

- Arthropod fauna
- Life cycle (Metamorphosis) of fly
- Faunal Succession Table; the order in which insects feed on a corpse is known as faunal succession.
- Faunal remains
- Entomotoxicological clues

36.3.1.1 Arthropod Fauna

The population of the arthropod fauna, being site-variant (place-specific), environmental variant and time variant (season-specific) varies with each place and time. The season variance ensures that the insect found on the body will correspond to the season in which the corpse has come into existence. The environmental conditions affect the growth of the insects and the succession table. Thus, the variables help to fix the site and the time and it also gives idea about the environments under which the corpse had been kept. In other words, it indicates the season and the time of the occurrence and the place or places where the corpse had been lying, kept or stored. The information unravels the events in the occurrence.

The arthropods, as already mentioned, are mostly necrophagous (corpse-eating) and are particularly relevant to medico-legal entomological investigations. The variations of the insects in each category due to varying environment further discriminate the evidence.

3. Any invertebrate of the phylum arthropoda having a segmented body, jointed limbs, and usually a chitinous shell that under goes moulting, including the insects spiders and other arachnids, crustaceans and myriapods.

36.3.1.1.1 Flies

Flies constitute ninety percent of the arthropods. They are found almost everywhere. The variety of flies is very large. They are the first on the scene. They prefer a moist corpse for the maggots to feed on, as such a corpse is easier for them to chew.

Flies have a strong sense of smell. They can smell blood and rotting flesh from a long distance. They are often the first to locate the dead. They prefer a moist corpse for their offspring (maggots) to feed on. The most significant types of flies are:

Blowflies:

They are also known as Cluster, Blue bottle, Green bottle or Black blowflies. This fly is about one cm long. Its body is in three segments. There are more than a thousand species of the fly in the world. The typical habitat for blowflies is temperate to tropical area. They prefer soft damp soil and litter. In such an environment larvae thrive and pupate.

Hatching from an egg to the first larval stage takes from eight hours to one day. Its development has three stages, called I instars, II instars and III instars. Each stage is separated by moulting event.

The forensic importance of this fly is that it is the first insect to reach the carrion at the scene because of the extraordinary sense of smell for the dead, from a long distance.

Flesh Flies:

Most of the species of flesh flies live and breed on flesh, dung, or decaying material. They have black and grey longitudinal stripes on the thorax. Some species lay their eggs in the gaping wounds. Other species give birth to live young flesh fly on dead bodies of humans and animals, at all stages of decomposition.

Housefly:

The housefly is the most common fly found in homes. It is known as the carrier of disease germs and infects people and food articles. The whole body of the housefly is covered with hair. On the thorax it has four longitudinal dark lines on the back. The underside abdomen is yellow. It lays about 500 eggs in batches of 75 to 150 eggs each. Hydrotaea species is of particular forensic importance.

The various stages of development of the fly family which help in forensic investigations are:

The Housefly:

It is about 8-12 mm long. It has two wings, two red eyes. The thorax is grey and is covered with four blackish lines. The body is covered with hair-like projections. The life span is about 2 to 4 weeks. It does not survive in the cold.

1. **The Eggs:** the eggs are found in clusters of about 75-150 eggs, on debris or rotting organic matter. They are about 1-2 mm long and are white in colour. They survive for about one day. Then they change to maggots (larvae).
2. **Maggots (larvae):** Instar I, II and III are various stages of growth of the maggots before they change into pupae. The life span of the maggot is more than one week. They are pale yellow in colour and about 3-9 mm long. They feed on rotten organic materials and are voracious eaters.
3. **Pupae:** They emerge from the III-instar maggots. They are about 8 mm long and are reddish brown in colour. The flies come from the pupae in about one week.

36.3.1.1.2 Beetles

Beetles are generally found on the corpse when it is more decomposed. In drier conditions, the moths replace beetles.

Beetles are seen on the corpse when the decomposition of the same is in an advanced stage. The common varieties of beetles met with in death cases are:

- Rove beetles
- Hister beetles
- Carrion beetles
- Hide beetles

The beetles have medico-legal importance because of their appearance after a specific period of death, their destruction of the maggots (they prefer to eat the maggots) because of their varied larval stages. Beetles usually lay eggs in the corpse itself. In some species the eggs take a long time to hatch into larvae. They usually appear on the cadavers in the advance stages of decomposition of the corpse, appearing at night most of the time and hiding under the corpse during the daytime.

They can live for a long time on the corpse.

Fig. 36.2
A beetle

36.3.1.1.3 Mites

Mites; there are many types of mites: they feed on a corpse. Some appear in the early stages of decomposition, while other mites feed on dry skin in the later stages of decomposition. If mites arrive at the corpse before any fly eggs hatch into maggots, they first eat the eggs, which delays maggot development. This may lead to incorrect PMI estimates.

Some beetles carry mites on their bodies, which feeds on fly eggs. If they arrive at the corpse before any fly eggs hatch into maggots, they eat the eggs. It delays maggot development. This may lead to incorrect PMI estimates.

36.3.1.1.4 Moths

Moths and butterflies are biologically related. Moths are almost the last visitors to the corpse assisting in its decomposition. The moth larvae feed on hair.

Moths feed on mammalian hair during their larval stages and may forage on any hair that remains. They are amongst the final arthropods contributing to the decomposition of a corpse.

36.3.1.1.5 Other arthropods

Other arthropods: are spiders, scorpions, wasps, ants, crabs, shrimps, myriapods (multi-legged creatures and live in the soil or in leaf debris).

Wasps, ants, and bees may feed on the body or may eat the insects feeding on the corpse during the early stages of decomposition. They may lay eggs, and the appearance of eggs and larvae on the body can mislead the Forensic experts to determine the post mortem interval (PMI).

In some countries, parents have used bees to punish their children to enforce discipline. They have also sometimes caused road accidents when they bite a person driving a vehicle. Forensic entomologists identify the sting marks in such cases.

The author has not come across even a single such case. However, the possibility of such cases cannot

36.3.2 Life Cycle (Metamorphosis) of a Fly

A fly is the first faunal visitor of the corpse. A housefly lays eggs on the available source, which may be garbage, faeces, wounds, sputum, spoiled food and dead matter including flesh. It lays about 500 eggs, in lots of about hundred (~75-150) eggs at one time. The eggs hatch in about 24 hours to give maggots (larvae). The larvae grow and pass through three stages:

[I Instars (1 day) ⟶ II Instars (2 days) ⟶ III Instars (4 days) ⟶ pupa]

Thus, in about a week's time the larva changes into a pupa, which, in turn, changes into a fly in about 10 days, leaving behind a puparia, the outer sheath of the larva. The fly is ready to mate in about two days. It lives for about a month.

Temperature and humidity play crucial roles in the life cycle (metamorphosis) of the fly.

(Life span ~ one month)

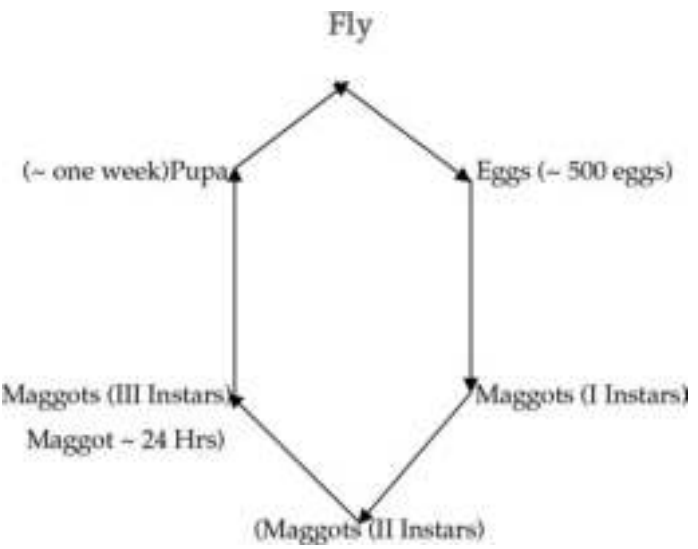

Fig. 36.3

Life Cycle of a Housefly

The above life cycle is for the common housefly, most common in necrophagous attacks. The lifecycles for other flies follow a similar pattern, though the details of the time element and their structures vary somewhat.

36.3.3 Faunal Succession Table

The order in which different insects or their products appear on a corpse is known as faunal succession. Faunal succession has been successfully utilised to get the most important information about the Post-Mortem Interval (PMI). Properly studied identification of the insects and their remains can lead the Forensic Entomologist to the five different stages of decompositions, which in turn can indicate the PMI. The five stages are:

1. Initial fresh stage; flies reach the corpse and start laying eggs in natural orifices or in the wounds.
2. Bloated stage
3. Initial active decomposition stage
4. Advanced decomposition stage
5. Dry remains of the corpse stage

The rough indicators of succession table are:

Presence of different species of flies, their eggs, maggots, larval stage, pupae, pupae moult and their co-presence indicate the succession. Flies are the first to reach a corpse.

House flies, flesh flies and blowflies are the common ones. The development of the larvae (length, weight) has also been used to find PMI.

1. The appearance of beetles and their eggs, larvae, pupae and young beetles; beetles usually appear on a corpse at an advanced stage of decomposition, often at the last stages of decomposition. They are easily seen as they have comparatively large sizes.
2. The identification of the species of mites helps to fix the PMI. Some species of the mites appear at early stages of decomposition. Some species of mites appear when the skin has dried.
3. Moths are the last visitors to the corpse. They feed on the hair of the corpse from all parts.

A number of factors condition the appearance of insects and other arthropods: temperature, humidity, environment, upkeep of the body and faunal access to the corpse, the destructive role of predatory insects and other creatures play their crucial roles. The Forensic Entomologist, therefore, has to be one with extensive experience not only in Forensic Entomology but also in the local fauna and environmental conditions. Otherwise, errors can vitiate the results.

36.3.4 Faunal Remains

The most important faunal remains are the moult of pupae[4], which it leaves when it comes out in the form of a fly. Its presence indicates that the insect had gone through its full life cycle. The fragments of flies are indicators of the species of the visitor and thus indicate the stage(s) of decomposition. The larvae of various stages of development are also useful indicators of the life cycle stage of the insect.

4. Cover shed by the pupa when it comes out as fly.

36.3.5 Entomotoxicological Clues

The remnants of insects including the flyspecks, regurgitated material and excreta are used as entomotoxicological clues. If the victim had died of poison, the poison will be found in the remnants of the insects. The analysis of the material can indicate qualitatively the nature of the poison. Modern instruments and techniques (chromatography!) can identify the poison.

36.4 IMPORTANCE

Forensic Entomology evidence is mostly corroboratory. In some cases, however, it has provided crucial evidence.

36.4.1 Time of Death

Forensic entomology provides useful method for determining **P**ost-**M**ortem **I**nterval (PMI) after about 3 days. It is accurate to a day or a range of days. In some cases, it may be the only method available to determine **P**ost-**M**ortem **I**nterval (PMI), elapsed time since death. The insects, however must be collected properly and its accuracy depends on this on suitable conditions for insects.

The **P**ost-**M**ortem **I**nterval (**PMI**) determination has been the most frequently attempted forensic investigation. The Forensic Pathologist, Medical Examiner, or the Coroner has been handling the work. However, it is the Forensic Entomologist, now, who provides the information on the post-mortem interval. It is determined from:

- The life cycle of the specific insects, and
- The faunal succession schedule of different species of insects

There are many variables like temperature, humidity and habitat. There are also unknown factors like the lifestyle of the subject, arrival time of the insects. The time of death determination, therefore, is often an intelligent guess.

> *In a small town of Italy the decomposing body of a woman was discovered in a tightly closed room, in the month of September. Nobody had been living in that house for a long time. The body was lying face down near the door and there were bloodstains on the floor and on the walls. The injury on the head was from a radiator hooker. It seems the woman had dragged herself to the door where she was found.*
>
> *The investigators called in Forensic Entomologists to the scene. The team found that the temperature and humidity of the room had been more or less constant throughout the past relevant period. There were a large number of maggots, pupae and puparia. Fly larvae of all stages (I instars, II instars, III instars) were found on the putrefying body. They were collected and preserved. Some of the pupae developed into flies which, in turn, were used to study their breeding.*
>
> *The findings were:*
>
> 1. *Only one type of insect (mono-specific necrophagous fly) had attacked the corpse.*
> 2. *No vertebrates like mice had nibbled the body.*
> 3. *Absence of other insects (necrophagous biodiversity) and absence of faunal succession schedule hindered estimate of the time of death.*
> 4. *The best estimate of the PMI, from the detailed study of the life cycle of the fly, that could be given, was that the death had taken place at least four months earlier*[5].

36.4.2 Culprit-Weapon-Victim Linkage

Dogs have been extensively used to locate narcotics, liquor, explosives and even the culprit in criminal investigations. But to harness flies to hunt the criminal is (or was) a fantastic idea.

5. For details: *Aggarwal's Internet Journal of Forensic Medicine and Toxicology*, 5 (1) 2004.

Ordinarily, the linkage of the culprit, victim and/or of the weapon *inter se* via Forensic Entomology is not possible as the culprit and the weapon are not at the scene when the insects generate the entomological evidence. However, it may happen in some odd cases. The Chinese case (*supra*) is, incidentally, the first recorded case and the oldest case — of thirteenth century — where Forensic Entomology was used to identify the culprit. Is it also the last such case? The author has not come across another similar one!

36.4.3 Kidnapper's Identification

It is comparatively a case of kidnapping, sexual abuse, pornography and murder, Danielle Van Dam, a girl child of 7 years, went missing on 1 February, 2002. The parents and police searched for her but to no avail. Then on 27 February, 2002 the naked putrefied body of the girl was found on the road side, quite close to the residence of her parents.

A neighbour of the deceased's family, Westerfield, was suspected to be the murderer as he had been at home on the crucial day. He was also seen to leave clothes with a launderer. The clothes were later found to carry the victim's blood. Further, the police recovered fingerprints, fibres and hair from the residence and vehicle of the suspect which were similar to those of the victim. Pictures of child pornography were also found in his computer. He was booked for murder.

The forensic evidence relating to blood, hair, fibre. played their respective roles. But Forensic Entomology provided the decisive blow.

Both sides produced about half a dozen Forensic Entomologists. The main question was to find the post-mortem interval (PMI). The whole evidence was thrashed threadbare. The court accepted the prosecution's version of the time of death and found the accused guilty of kidnapping and of first degree murder.(CH)

36.4.4 Child Abuse

Child abuse, followed by murder, is a fairly frequent crime in India. Usually, a child of tender age is enticed, taken to a lonely place abused and murdered. The body is thrown at a secluded place or buried. The body may be discovered after days or sometimes even after weeks.

The body so discovered is often decomposed and infested by insects to varying extent, depending upon the post-mortem interval, temperature, humidity, environment. The presence of eggs, maggots, larvae of various stages of development, pupae and puparia (the life cycle of a necrophagous fly) and the faunal succession can indicate the PMI. A lot of work is being done to find the correct PMI. Yet the success rate for ascertaining the correct PMI eludes the scientists at present. The plethora of variables obstruct the investigations.

In a case of child abuse and murder, entomological evidence was collected from different parts of the body. It was found that the child was killed 6-8 days before the post-mortem. The examination of the entomological evidence collected from the facial orifices indicated that the death had taken place 8-9 days prior to the collection of the insect population. When the evidence from the ano-genital parts was examined, the insects' life cycle indicated that the death had taken place about 14 days earlier. Apparently, the child was alive for 14 days but the ano-genital parts of the abused child had not been cleaned for that period and the faunal evidence developed even when the child was still alive. (CH)

36.4.5 Narcotics' Origin

The menace of drug abuse is a worldwide scourge. If the narcotic is of plant origin its place or country of cultivation can be found. One of the most important narcotics, volume-wise and cases-wise, is cannabis. The drug is often in the form of dried leaves and stems, compressed to reduce the volume. Cannabis in this form carries faunal evidence, dead or alive. As the fauna is region and climate specific, the place from where the drug has come can be identified. It will certainly be useful to fix the place of origin of the drug. The processing of the entomological evidence is more convenient than the chemical methods utilized at present to find the place of origin of the drug.

Raw opium is also amenable to find the place of origin via entomological evidence. Highly processed drugs like heroin, cocaine crystals and synthetic drugs remain outside the domain of Forensic Entomology.

Insect evidence **may reveal the presence of drugs**. Maggots bio-accumulate them enabling analysis to determine the type of drug present.

36.4.6 Punishment Stings

It is quite unfortunate that some people punish their wards and household servants by subjecting them to stings by wasp and bees. Not only the stings are painful, they may scar the victims psychologically, sometimes making them mental wrecks. If a number of wasps or bees sting the victim, he or she may die. In such cases Forensic Entomology may provide evidence in some such cases against the culprit.

36.4.7 Illegal Poaching

Forensic entomology has also been utilized in illegal poaching.

> *Some years ago two baby black bears were found shot dead in Canada with their gall bladders removed, presumably to be used as medicine.*
>
> *Witnesses had heard gunshots and spotted a vehicle. Two men were found hiding near the bear's bodies and witnesses were able to confirm the suspects belonged to the vehicle that had been sighted earlier.*
>
> *The witnesses' recollections were helpful leads, but the police officers could not hold the two men solely on suspicion. More evidence was needed in order to connect the two suspects to the crime. Blowfly eggs were found and collected from the bears' bodies and sent to an experienced entomologist. Anderson, as, knew that blowfly eggs take twenty-two hours to hatch in the hot summer temperatures in which the bears were found. By counting back twenty-two hours and taking into account the weather data for the time the bears were discovered, the expert was able to find when the fly eggs were first deposited on the bodies. The time found for the eggs matched with the time the witnesses spotted the two suspects near the crime scene, heard the gun shots and saw their vehicle.* (CH)

36.4.8 The shifting of the body

The culprit may shift the body to fake the scene or to a hiding place. Insects on the body may be native to the first habitat and not to the second. This will show that not only was the body moved, but it will also indicate the real crime scene.

36.4.9 Body disturbed after death

Disturbing the body may disturb the insects cycle, and the entomologist may be able to determine not only the date of death, but also the date when the body was disturbed.

36.4.10 Presence/position of wounds

The decomposition often obscures wounds. Their presence and position are indicated by the insect colonies. They colonise in a specific pattern, usually laying eggs first in the facial orifices, unless there are wounds, where they colonise first. Then proceed down the body. If the maggot activity is centred away from the natural orifices, then it is likely that this is the site of a wound.

36.4.11 Suspect at the crime scene

An insect from the scene on the person of the accused places him at the scene.

36.4.12 Child or senior abuse/neglect

Some insects will colonise wounds or unclean areas on a living person. This is called cutaneous myiasis.

In these cases, the victim is still alive, but maggot infested. A forensic entomologist will be able to tell when the wound or abuse occurred. For instance, in the case of neglected children,

the onset of maggot infestation will give a minimum time interval since the child last had a diaper change. Such cases occur particularly among young children and seniors.

36.4.13 Miscellaneous

The use of Forensic Entomology in diverse criminal situations is increasing steadily. The following are some of the additional avenues where entomology can help:

- Identification of Scene of Occurrence.
- Time of Decapitation.
- Time of Dismemberment.
- Shifting of the *corpus delicti*.
- Bite marks of ants and cockroaches.
- Blood flyspecks. Flyspecks are sometimes confused with bloodstains. Are they the result of the criminal act or are the flyspecks left by the insects?
- The insect's body material may contain blood or other body material from the victim, which can be used to find the DNA profile of the victim. It is rare when residue from the insects is available.
- The insect's body material may be available. It may contain the poison (or narcotic drug) which might have caused the death of the victim. Identification of poison from the insect's body material has been given the fancy name: **Entomotoxicology**. However, if the body of the victim is available, it provides better material for locating the drug. It may not be available in some cases.
- Neglect of wounds on the incapacitated (old) person under both private and institutional care. The presence of fauna will indicate neglect.
- The role of the insects (bees and wasps) in causing car accidents when there is only a single driver occupant in the vehicle.

36.5 EVIDENTIARY CLUES

The evidentiary clues in Forensic Entomology are insects, their excretion and their remnants. They have to be located, collected, preserved, packed, transported, stored and evaluated. The various steps have to be taken in such a way their identity, relevancy, integrity, authenticity *vis-a-vis* the incident being investigated, continuity of the chain of custody is preserved and that legal formalities are observed in letter and spirit so that the courts do not question their validity and legitimacy on those counts and reject the evidence.

Forensic Entomology is a comparatively new branch. The police investigator may not be well versed in handling the evidence. It is, therefore, advisable, rather essential, to associate a well-versed Forensic Entomologist not only at the crime scene but also at the time of post-mortem examination also.

36.5.1 Location

The sources for faunal evidentiary clue materials are mainly:

1. **The Corpse**: The usual sites for the insects in the exposed or rotting body. Eggs and maggots are found in the natural orifices, wounds and injuries created by predatory creatures.
2. **The moist and loose soil:** under the corpse. The entities may have fallen there. Beetles also hide themselves in the soil on which the dead body lies.

3. **Clothes on Corpse**: The entomological creatures and material may move into the dead body clothes.
4. **The Coffin and the Burial Site:** The evidence may also be found in the coffin or burial site.
5. **Corpse Coverings (Bags, Sheets)**: The coverings of the corpse or its parts carry faunal evidence when they are used to keep (and carry) the corpse in an advance stage of decomposition or the body is kept in them for a long time.
6. **Burrows:** Insect may also be found in burrows which the insects may have created in the earth under the corpse, if the body had been lying there for a considerable time.
7. **The site (Scene)**

36.5.2 Documentation of Recovery

The discovery/recovery of the faunal evidence (like other evidence) is properly documented with the usual modes the location of the evidence must be documented by the usual modes:

1. **A video film:** of the scene and the surroundings along with close up shots of the evidential clue
2. **Photography:** the scene, the evidence is photographed; with identity chit, which contains the FIR No., Police station, date and the name of the investigator along with a scale. Both close-ups (to specify the evidence) and general photographs (to fix the site) are taken, usually in daylight. A flash light gives poor results.
3. **Sketch to scale:** 3-dimensional sketching software has come up, it should be used.
4. **Textual notes:** record of the scene and the conditions of the evidence are indispensable.
5. **Record the ecological environmental condition:** for proper appreciation of the faunal evidence:
   - The climate of the scene area prior and subsequent to the initiation of the examination of the scene. Usually, about 5 days' climate prior to and before the occurrence should be noted. The information helps to estimate the life cycle of the predatory insects on the corpse.
   - The availability of air and nature of soil underneath the body should be noted. They play an important role in the developments of insects and their products.

36.5.3 Arthropod Evidence Collection Principles

The officer collecting the clues should:

1. Document the evidence at the scene, on the body of the victim, including insects bite marks.
2. Collect one spoon full of insects each from at least three different sites of the corpse and the crime scene in three different, clearly labelled jars.
3. Put half of the insects in 98% ethanol/methylated spirit. Killed insects can be stored in frozen condition. Other media (formalin) are not used.
4. Kill the arthropods with hot water before placing them in ethanol.
5. Place half of the insects alive in a refrigerator. Cover them with fabric.
6. Keep white larvae separate from brownish larvae.
7. Keep larvae and adults separately.

8. Secure the help of Forensic Entomologist for handling the evidence, whenever possible.
9. Write complete information (location, exact time, date, initials) on a properly secured/attached label.
10. Only an experienced entomologist knowing the local entomological fauna[6] handles the evidence.

36.5.4 Collection process

Forensic investigations are based upon on clue materials collected from the victim, from the culprit and from the crime scene, which are located, seized, recorded, preserved packed and seized as per law of the land and departmental rules The total process vis-à-vis insect evidence is a hard nut to crack, in view of the variables (*supra*), discussed above. It is not a job of investigating officer alone, he should involve a forensic entomologist who understands the surroundings also.

36.5.4.1 Collection from the scene

If the scene is an outdoor scene, the Forensic Entomologist notes/collects:

1. the landscape, plants and soil types
2. The weather
3. The Temperature; it is especially important and if possible, a portable recording device is left to record long-term changes.
4. A soil sample.

If the scene is indoors, an investigator looks for access points where insects could get in. From the body, the forensic entomologist takes several samples from different areas of the body.

1. If there are maggots, some are collected, placed in boiling water and preserved in alcohol. This stops development. Other maggots are collected alive so that they can be kept until they reach adulthood. At this stage, the species can be determined.
2. Normally, eggs are collected only if there are no later stages associated with the body. Again, some are taken and preserved in alcohol while others are watched until they hatch.
3. Empty pupal casings (puperia moult) are also collected.
4. Adult flies are collected if the wings are crumpled. This suggests they have emerged from its moult and can be linked to the body. Otherwise, they are not collected since they may have just arrived to the scene from outside.

The careful and accurate collection of insect evidence at the scene is essential. Ideally, an entomologist collects a range of insects of different stages from different areas of the body and the surroundings (e.g., clothing or soil). Different species, or insects collected from different areas, are kept separately.

36.5.4.2 Evidence from flies

The entomological evidence from the flies are eggs, larvae or maggots, pupae, empty pupal cases (moult) or as adults.

36.5.4.2.1 Eggs

Eggs are laid in clumps. They are usually found in wounds or natural orifices. They are collected with a damp paint brush. Half are preserved in alcohol and half are collected alive.

6. In some area the entomologist have prepared a faunal dictionary of the local fauna, It is useful.

Eggs are especially important when maggots or later insect stage products are absent. The time of hatching is vital and their progress is monitored every few hours.

36.5.4.2.2 Maggots

Maggots are found on or near the remains and may be in large numbers. The masses generate heat, which speeds up development. The site of the maggot mass, the temperature (and size) of each mass are important. Large maggots are usually older, but small maggots may belong to a different species. So maggots of different sizes are collected separately. Half the sample is kept alive and half preserved immediately.

Preservation allows the entomologist to see what stage the maggots were in when collected. Preserved specimens may also be used as evidence in court.

36.5.4.2.3 Pupae

Pupae are dark brown, oval, and the size range from 2-20 mm. They and their moulting (carcasses) are very important but they are easily missed. Pupae live away from the wet food source. They won't grow and their exact age cannot be determined until the adult emerges. They are found:

- In clothing
- Under rugs

Empty pupal carcass looks like pupae but has one end open from where the adult fly had emerged. They do not provide substantial evidence. Pupae are not preserved.

36.5.4.2.4 Adult Blow Flies

Adult Blow Flies are not as important as eggs, maggots or pupae. They indicate only the species of insect.

Flies, smaller than blow flies, are important at all stages as they indicate the succession of insects on the remains

36.5.4.2.5 Beetles

Beetles (Coleoptera) are found as adults, larvae, pupae and as cast skins.

All beetle stages are important. They move fast and are often found under the body, or in and under clothing. They are collected and preserved in alcohol.

36.5.5 Collection Kit

Proper collection of faunal evidence needs some elementary collection tools. A brief list is given below:

1. Camera and video camera, to fix the evidence site:
2. Net to catch flies. Sticky traps are also used instead.
3. Live specimen containers; killed creatures container jar; forceps; spoon; small paint-brushes;
4. Sifting screens
5. Preservatives: usually 98% alcohol (ethanol) is used.
6. Thermometers to measure body temperature and/or temperature of the surroundings.

7. Recording materials like labels, pencil, ruler, crime scene form, if any, prescribed by the authorities.
8. Gloves, hand towels and hand wash are usually taken along to maintain hygiene.

36.6 EVALUATION

The evaluation of the faunal evidence is highly specialised work. A Forensic Entomologist needs long experience, thorough knowledge of not only entomology but also the local environment and its arthropod faunal population, their habitat preferences and breeding modes and schedules.

36.6.1 Sources of Errors

There are many sources of error in the evaluation of faunal evidence. The entomologist has to vigilant about them. Otherwise, the result can lead to injustice. The following aspects are kept in mind:

1. The influence of environment is important. It can stunt or enhance the rate of growth of the creatures
2. Flies will also feed on the blood and then pass the partially digested blood in its faeces, which are known as "flyspecks". Flies will also regurgitate and possibly drop a blood droplet on a remote surface, which may serve to confuse bloodstain analysis.
3. There are predatory insects, which eat eggs and larvae laid by the earlier insects. Thus, they can mislead the entomologist in the evaluation of PMI.

The main entomological evaluation is the identification and differentiation of the species of the insect, its remains and remnants. Modern technology has facilitated the process and made it easy. The seasoned entomologists use the following tools and techniques routinely.

36.6.2 Traditional Tools

Traditional tools for the examination Forensic Entomological evidence are still the first tool used in the evaluation of the evidence. The important instruments are:

1. **Hand Magnifier:** it is now fitted with lighting arrangement.
2. **Microscopes**: stereo and research microscopes with supporting paraphernalia are common.
3. **Spot light lamps**
4. **Staining agents/other chemicals**: for example, Potassium permanganate staining is used to study eggs. They are examined after rinsing with saline in 1% potassium permanganate solution for about one minute and then studied under a microscope with a calibrated eyepiece, to evaluate and compare (with standards) its morphological characteristics like the size (length and width).

36.6.3 Modern Tools

36.6.3.1 Scanning Electron Microscope

Among the modern tools, the Scanning Electron Microscope (SEM) is assuming great importance. Its high magnifying power, high resolution and three dimensional images are making it the tool of choice for morphological studies of the entomological evidence like fly eggs and larvae, which help to determine the PMI. The SEM reveals the fine distinction between the eggs and larvae of various species through clear images of the shape, size and individual morphological characteristics of the entities.

The SEM is becoming an indispensable tool for correct and proper evaluations.

36.6.3.2 DNA Profiling

DNA is being used to identify the species of the insects when the morphological studies do not provide adequate data to differentiate the species.

36.6.3.3 Gene studies

The usual methods to find the age of the flies was through the morphological characters and size of the instars. Studies have shown some promising results for the determination of the age of an egg or a pupa, based on changes of some genes. These genes are likely to have varied levels during different times of the egg or pupa development process and change linearly with the age of the egg or pupa.

The chart of changes prepared in the case in hand is compared with a standard chart prepared from the same known species and the age of the evidence ascertained with a high confidence value.

The technique is likely to gain popularity and would provide more accurate PMI in the coming times.

With the continued developments of newer and better techniques and the arthropods being so plentiful and widespread, they are bound to play an important role in the dissemination of justice in the coming times.

36.7 CONCLUSION

Forensic Entomology has a poor past, unimpressive present and a bleak future.

Firstly, it is involved in most of the heinous crimes like murders, rape-murders, spouse killing and infanticide. The courts demand proof beyond doubt. Forensic Entomology seldom goes beyond corroboration. It can unravel the time of death, almost correctly if the environmental and upkeep of the corpse is known. But it seldom happens.

Secondly, there have been tremendous research inputs in tools and techniques. They have increased the confidence level of the findings impressively. SEM for morphological studies, DNA for genetic identification of the species, HPLC and Mass Spectroscopy for poisonous residues in the body. have changed the entire scenario in the field but they play a limited role in Forensic Entomology evaluations.

Lastly, the need of the speciality is expanding. It is no longer the fiefdom of the Forensic pathology. It plays substantial role in the fields of hygiene, food processing and preservation system and in environmental pollution control. They hold a beckoning light for the speciality. However, some stumbling blocks hider its full exploitation:

1. Inadequate research.
2. Ignorance about the speciality.
3. Limited avenues; even in USA there are only 8 certified Forensic Entomologists!
4. Limited number of Forensic Entomology institutes.

36.8 ADDITIONAL READINGS

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2. Byrd, J.H. and J.L. Castner. 2001. *"Forensic Entomology: Insects in Legal Investigations"*. CRC Press. Boca Raton, FL.
3. Greenberg, B. and Kunich, J.C. 2002. *Entomology and the Law: Flies as Forensic Indicators.* Cambridge University Press, Cambridge, United Kingdom
4. *Forensic_Entomology*: "http://en.wikipedia.org/wiki/"

CHAPTER 37

CASE LAW [LANDMARK JUDGMENTS]

SYNOPSIS

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37.1 TESTIMONIAL COMPULSION[1]

Author's Summary

This judgment clarified the intent and content of the Article 20(3); which says that an accused person cannot be compelled to be a witness against himself. whether collection of certain types of evidence, (handwriting/fingerprints/footprints photograph, etc.) from a suspect, contravenes the constitution or not. Many a court said it does; others said it did not. Thus a confusion was created.

The full bench in this case decided it does not. They ruled collection of the clues in not evidence. It becomes evidence after the expert evaluates it; which may favour the accused also. They also mentioned that the Constitution makers did not intend to obstruct justice.

This judgment thus made it possible to use important forensic clues in the delivery of justice.

Highlights italicised

1. *State of Bombay v Kathi Kalu Oghad,* AIR 1961 SC 1808 : (1962) 3 SCR 10 : (1961) 2 Cr LJ 856 (SC).

Relevant Extract Verbatim

It is not necessary to state in any detail the facts of each of the cases now before us. We shall, therefore, state only so much of the facts as have occasioned calling in aid of the provisions of clause (3) of Article 20 of the Constitution. In the first case, namely, Criminal Appeal 146 of 1958, the State of Bombay is the appellant. The respondent was charged, along with another person, under section 302, read with section 34 of the Indian Penal Code, as also under section 19(e) of the Indian Arms Act (XI of 1878). The trial court found him guilty of those charges and sentenced him to imprisonment for life under section 302 read with section 34 of the Indian Penal Code and to a term of two years rigorous imprisonment for the offence under the Arms Act. At the trial, the identification of the respondent, as one of the two alleged culprits, was the most important question to be decided by the court. Besides other evidence, the prosecution adduced in evidence a chit-Ex. 5 alleged to be in his handwriting and said to have been given by him. In order to prove that Ex. 5 was in the handwriting of the respondent, the police had obtained from him, during the investigation, three specimen handwritings of his on three separate sheets of paper which were marked as Exs. 27, 28 and 29. The disputed document, namely, Ex. 5 was compared with the admitted handwriting on Exs. 27, 28 and 29 by the handwriting expert whose evidence was to the effect that they are all writing by the same person. At the trial and in the High Court, the question was raised as to the admissibility of the specimen writings contained in Exs. 27, 28 and 29, in view of the provisions of Article 20(3) of the Constitution. It is an admitted fact that those specimen writings of the accused had been taken by the police while he was in police custody, but it was disputed whether the accused had been compelled to give those writings within the meaning of clause (3) of Article 20. The plea of the accused that he was forced by the Deputy Superintendent of Police to give those writings has not been accepted by the learned trial judge. But those documents have been excluded from consideration as inadmissible evidence, on the ground that though there was no threat or force used by the police in obtaining those writings from the accused person, yet in the view of the court "the element of compulsion was implicit in his being at that time in police custody". In this conclusion both the trial judge and High Court have agreed. The identification of the accused person was also sought to be proved by the evidence of witnesses, who identified him at an identification parade. But the holding of the identification parade has not been sought to be brought within the prohibition of clause (3) of Article 20. After eliminating the Exs. 27, 28 and 29 from their consideration, the High Court, on a consideration of the other evidence in the case came to the conclusion that the identity of the respondent had not been established beyond a reasonable doubt. Hence, giving him the benefit of doubt, they acquitted him. The State of Bombay moved this court and obtained special leave to appeal from the judgment and order of acquittal, passed by the High Court. On these facts, the only questions of constitutional importance that this Bench has to determine are: (1) whether by the production of the specimen handwritings – Exs. 27, 28 and 29 – the accused could be said to have been 'a witness against himself within the meaning of Article 20(3) of the Constitution; and (2) whether the mere fact that when those specimen handwritings had been given, the accused person was in police custody could, by itself, amount to compulsion, apart from any other circumstances which could be urged as vitiating the consent of the accused in giving those specimen handwritings. This Bench is not concerned with the further question whether in all the circumstances disclosed by the evidence in this case, the accused could be said to have compelled, as a matter of fact, to give those specimens.

The arguments at the Bar may be classified as taking three distinct lines.

> *The first line, on the one extreme, may be said to have been taken by Mr. Sikri, the Advocate General of Punjab, and which may be characterised as a narrow view, runs as follows: Clause (3) aforesaid, in view of its setting, its history and the policy underlying, the privilege accorded by the Constitution to an accused person, should not be applied at the stage of investigation of*

an offence. It should be confined to cases of compulsory extraction of incriminating statements or communications by an accused person in court, the expression 'compelled to be a witness' being understood as meaning 'being compelled to give oral testimony'. It does not include the compulsory production of documents. Similarly, it does not prohibit the compulsory exhibition or examination of the body of the accused, or any part of it, or the taking of specimen writing, thumb impression, impression of the palm or the feet or the fingers of an accused. Whether or not there has been compulsion should be judged by the nature of the action taken by the authority, or the court that determines the controversy, and not the state of mind of the accused.

On the other extreme is the argument by Mr. S.P. Verma, for the accused in the first case, who contended that the clause aforesaid of the Constitution gives complete protection of the widest amplitude to an accused person, irrespective of the time and place and of the nature of the evidence, whether it is oral or documentary or material. The extreme form, which his argument took can best be stated in his own words as follows:—

> *Anything caused, by any kind of threat or inducement, to be said or done by a person, accused or likely to be accused of any offence, by non-voluntary positive act or speech of that person, which furthers the cause of any prosecution against him or which results or is likely to result in the incrimination of that person qua any offence, is violative of the fundamental right guaranteed under clause (3), Article 20 of the Constitution of India.*

According to his argument, if an accused person makes any statement or any discovery, there is not only a rebuttable presumption that he had been compelled to do so, but that it should be taken as a conclusive proof of the inferential fact. Any kind of inducement, according to him, is also included in the expression 'compulsion' by the police or someone else. The test, according to him, is not the volition of the accused but the incriminatory nature of the statement or communication. Hence, any statement made to a police officer, while in police custody, brings the same within the prohibitory ambit of the clause of the Constitution. On the face of them, the propositions propounded by Mr. Verma are much too broadly and widely stated to be accepted.

The third view, which may be characterised as an intermediate view, was advocated by the learned Attorney-General, appearing for the Union. *According to him, a person seeking protection under the clause must satisfy all the four constituent elements contained in clause (3) of article 20 namely:—(1) he must be an accused person; (2) he must have been compelled; (3) the compulsion must be to be a witness; and (4) against himself. Compulsion, according to him, means coercion or constraint and does not include mere asking by the police to do a certain thing or the direction by a court to give a thumb impression or specimen of writing. In other words, compulsion has to be equated to what has been sometimes characterised as 'third degree' methods to exhort confessional statements. "To be a witness" is an expression which must be understood in consonance with the existing law of evidence and criminal procedure, e.g.*, sections 27 and 73 of the Evidence Act and section 94 and 96 of the Code of Criminal Procedure. Though, according to English law, the expression is confined to oral testimony he was prepared to go to the length of conceding that any statement, whether oral or in writing by an accused person, transmitting his knowledge disclosing relevant facts of which he was aware, would amount to 'being a witness' against himself. But mere production of some material evidence, by itself, would not come within the ambit of the expression "to be witness".

The several questions for decision arising out of this batch of cases have to be answered with reference to the provisions of clause (3) of Article 20 of the Constitution which is in these terms:

No person accused of any offence shall be compelled to be a witness against himself.

These provisions came up for consideration by the full court in the case of *M.P. Sharma v Satish Chandra.*[1] Though the question directly arising for decision, in that case, was whether a search and seizure of documents under the provisions of sections 94 and 96 of the Code of Criminal Procedure came within the ambit of the prohibition of clause (3) of Article 20 of

the Constitution, this court covered a much wider field. Besides laying down that the search and seizure complained of in that case were not within the prohibition, this court examined the origin and scope of the doctrine of protection against self-incrimination with reference to English Law and the Constitution of the United States of America, with particular reference to the Fourth and Fifth Amendments. On an examination of the case law in England and America and the standard textbooks on evidence, like Phipson and Wigmore, and other authorities, this court observed as follows:—

> *Broadly stated the guarantee in Article 20(3) is against "testimonial compulsion". It is suggested that this is confined to the oral evidence of a person standing his trial for an offence when called to the witness stand. We can see no reason to confine the content of the constitutional guarantee to this barely literal import. So to limit it would be to rob the guarantee of its substantial purpose and to miss the substance for the sound as stated in certain American decisions. The phrase used in article 20(3) is "to be a witness". A person can "be a witness" not merely by giving oral evidence but also by producing documents or making intelligible gestures as in the case of a dumb witness (see section 119 of the Evidence Act) or the like "To be a witness" is nothing more than "to furnish evidence", and such evidence can be furnished through the lips or by production of a thing or of a document or in other modes. So far as production of documents is concerned, no doubt section 139 of the Evidence Act says that a person producing a document on summons is not a witness. But that section is meant to regulate the right of cross-examination. It is not a guide to the connotation of the word "witness", which must be understood in its natural sense, i.e., as referring to a person who furnishes evidence. Indeed, every positive volitional act which furnishes evidence is testimony, and testimonial compulsion connotes coercion which procures the positive volitional evidentiary acts of the person, as opposed to the negative attitude of silence or submission on his part. Nor is there any reason to think that the protection in respect of the evidence so procured is confined to what transpires at the trial in the court room. The phrase used in article 20(3) is "to be a witness" and not to "appear as a witness". It follows that the protection afforded to an accused insofar as it is related to the phrase "to be a witness" is not merely in respect of testimonial compulsion in the court room but may well extend to compelled testimony previously obtained from him. It is available, therefore, to a person against whom a formal accusation relating to the commission of an offence has been levelled which in the normal course may result in prosecution. Whether it is available to other persons in other situations does not call for decision in this case.*

This court did not accept the contention that the guarantee against testimonial compulsion is to be confined to oral testimony at the witness stand when standing trial for an offence. The guarantee was, thus, held to include not only oral testimony given in court but also to statements in writing which incriminated the maker when figuring as an accused person. After having heard elaborate arguments for and against the views thus expressed by this court after full deliberation, we do not find any good reasons for departing from those views. But the court went on to observe that "to be a witness" means "to furnish evidence" and includes not only oral testimony or statements in writing of the accused but also the production of thing or of evidence by other modes. It may be that this court did not intend to lay down, certainly it was not under discussion of the court as a point directly arising for decision, that calling upon a person accused of an offence to give his thumb impression, his impression of palm or fingers or of sample handwriting or signature comes within the ambit of "to be a witness", which has been equated to furnish evidence". Whether or not this court intended to lay down the rule of law in those wide term has been the subject-matter of decisions in the different High Courts in this country. Those decisions are, by no means, uniform; and conflicting views have been expressed even in the same High Court on different occasions. It will serve no useful purpose to examine those decisions in detail. It is enough to point out that the most recent decision, to which our attention was called, is of a Full Bench of the Kerala High Court in the case of *State of Kerala v K.K. Sankaran Nair*[2]. In that case, Ansari, C.J., who delivered the opinion of the court, has made reference to and examined in detail the pronouncements of the different

2. AIR1960 Ker 392.

High Courts. Ultimately he came to the conclusion that the decision of this court in the case of *M.P. Sharma v Satish Chandra*,[3] also covered the case of a specimen handwriting given by an accused person, under compulsion.

> *"To be a witness" may be equivalent to "furnishing evidence" in the sense of making oral or written statements, but not in the larger sense of the expression so as to include giving of thumb impression or impression of palm or foot or fingers or specimen writing or exposing a part of the body by an accused person for purpose of identification. "Furnishing evidence" in the latter sense could not have been within the contemplation of the Constitution makers for the simple reason that – though they may have intended to protect an accused person from the hazards of self-incrimination, in the light of the English law on the subject – they could not have intended to put obstacles in the way of efficient and effective investigation into crime and of bringing criminals to justice. The taking of impressions of parts of the body of an accused person very often becomes necessary to help the investigation of a crime. It is as much necessary to protect an accused person against being compelled to incriminate himself, as to arm the agents of law and the law courts with legitimate powers to bring offenders to justice. Furthermore it must be assumed that the Constitution makers were aware of the existing law; for example section 73 of the Evidence Act or sections 5 and 6 of the Identification of Prisoners Act (XXXIII of 1910). Section 5 authorises a magistrate to direct any person to allow his measurements or photographs to be taken, if he is satisfied that it is expedient for the purposes of any investigation or proceeding under the Code of Criminal Procedure to do so: 'Measurements' include finger impressions and footprint impressions. If any such person who is directed by a magistrate, under section 5 of the Act to allow his measurements or photographs to be taken resists or refuses to allow the taking of the measurements or photographs, it has been declared lawful by section 6 to use all necessary means to secure the taking of the required measurements or photographs. Similarly section 73 of the Evidence Act authorises the court to permit the taking of finger impression or a specimen handwriting or signature of a person present in court, if necessary for the purpose of comparison.*

The matter may be looked at from another point of view. The giving of finger impression or of specimen signature or of handwriting, strictly speaking, is not 'to be a witness'. 'To be a witness' means imparting knowledge in respect of relevant facts by means of oral statements or statements in writing by a person who has personal knowledge of the facts to be communicated to a court or to a person holding an enquiry or investigation. A person is said 'to be a witness' to a certain state of facts which has to be determined by a court or authority authorised to come to a decision by testifying to what he has seen, or something he has heard which is capable of being heard and is not hit by the rule excluding hearsay, or giving his opinion, as an expert, in respect of matters in controversy. Evidence has been classified by text writers into three categories, namely, (1) oral testimony; (2) evidence furnished by documents; and (3) material evidence. We have already indicated that we are in agreement with the full court decision in *Sharma's* case[4] that the prohibition in clause (3) of Article 20 covers not only oral testimony given by a person accused of an offence but also his written statements which may have a bearing on the controversy with reference to the charge against him. The accused may have documentary evidence in his possession which may throw some light on the controversy. If it is a document which is not his statement conveying his personal knowledge relating to the charge against him, he may be called upon by the court to produce that document in accordance with the provisions of section 139 of the Evidence Act, which, in turn provides that a person may be summoned to produce a document in his possession or power and that he does not become a witness by the mere fact that he has produced it, and therefore, he can be cross-examined if he is called as a witness who has made statements conveying his personal knowledge by reference to the contents of the document or if he has given his statements in court otherwise than by reference to the contents of the documents. In our opinion, therefore, the observation of this court in *Sharma's* case[1] that

3. AIR 1954 SC 300.
4. *Ibid.*

section 139 of the Evidence Act has no bearing on the connotation of the word 'witness' is not entirely well-founded in law. It is well-established that clause (3) of article 20 directed against self-incrimination by an accused person. Self-incrimination must mean conveying information based upon the personal knowledge of the person giving the information and cannot include merely the mechanical process of producing documents in court which may throw a light on any of the points in controversy, but which do not contain any statements of the accused based on his personal knowledge. For example, the accused person may be in possession of a document which is in his writing or which contains his signature or his thumb impression. The production of such a document, with a view to comparison of the writing or the signature or the impression, is not the statement of an accused person, which can be said to be of the nature of personal testimony. When an accused person is called upon by the court or any other authority holding an investigation to give his finger impression or signature or a specimen of his handwriting, he is not giving any testimony of the nature of a 'personal testimony.' The giving of a 'personal testimony' must depend upon his volition. He can make any kind of statement or may refuse to make any statement. But his finger impressions or his handwriting in spite of efforts at concealing the true nature of it by dissimulation cannot change their intrinsic character. Thus, the giving of finger impressions or of specimen writing or of signatures by an accused person, though it may amount to furnishing evidence in the large sense, is not included within the expression 'to be a witness.'

> ***In order that a testimony by an accused person may be said to have been self-incriminatory, the compulsion of which comes within the prohibition of the constitutional provision, it must be of such a character that by itself it should have the tendency of incriminating the accused, if not also of actually doing so. In other words, it should be a statement which makes the case against the accused person at least probable, considered by itself. A specimen handwriting or signature or finger impressions by themselves are no testimony at all, being wholly innocuous because they are unchangeable except in rare cases where the ridges of the fingers or the style of writing have been tampered with. They are only materials for comparison in order to lend assurance to the court that its inference based on other pieces of evidence is reliable. They are neither oral nor documentary evidence but belong to the third category of material evidence which is outside the limit of 'testimony'.***

Similarly, during the investigation of a crime by the police, if an accused person were to point out the place where the *corpus delicti* was lying concealed and in pursuance of such an information being given by an accused person, discovery is made within the meaning of section 27 of the Evidence Act, such information and the discovery made as a result of the information may be proved in evidence even though it may tend to incriminate the person giving the information, while in police custody. Unless it is held that the provisions of section 27 of the Evidence Act, insofar as they make it admissible evidence which has the tendency to incriminate the giver of the information, are unconstitutional as coming within the prohibition of clause (3) of Article 20, such information would amount to furnishing evidence. This court in *Sharma's* case[5] was not concerned with pronouncing upon the constitutionality of the provisions of section 27 of the Evidence Act. It could not, therefore, be said to have laid it down that such evidence could not be adduced by the prosecution at the trial of the giver of the information for an alleged crime. The question whether section 27 of the Evidence Act was constitutional because it offended article 14 of the Constitution was considered by this court in the case of *State of Uttar Pradesh v Deomen Upadhyaya.*[6] It was held by this court that section 27 of the Evidence Act did not offend Article 14 of the Constitution and was, therefore, *intra vires.* But the question whether it was unconstitutional because it contravened the provisions of clause (3) of Article 20 was not

5. *Ibid.*
6. AIR 1945 SC 300.

considered in that case. That question may, therefore, be treated as an open one. The question has been raised in one of the cases before us and has, therefore, to be decided. The information was given by an accused person to a police officer leading to the discovery of a fact which may or may not prove incriminatory has been made admissible in evidence by that section. If it is not incriminatory of the person giving the information, the question does not arise. It can arise only when it is of an incriminatory character so far as the giver of the information is concerned. If the self-incriminatory information has been given by an accused person without any threat, that will be admissible in evidence and that will not be hit by the provisions of clause (3) of Article 20 of the Constitution for the reason that there has been no compulsion. It must, therefore, be held that the provisions of section 27 of the Evidence Act are not within the prohibition aforesaid, unless compulsion had been used in obtaining the information.

In this connection the question was raised before us that in order to bring the case within the prohibition of clause (3) of Article 20, it is not necessary that the statement should have been made by the accused person at a time when he fulfilled that character; it is enough that he should have been an accused person at the time when the statement was sought to be proved in court, even though he may not have been an accused person at the time he had made that statement. The correctness of the decision of the Constitution Bench of this court in the case of *Mohammed Dastagir v State of Madras,* was questioned because it was said that it ran counter to the observations of the full court in *Sharma's* case. In the full court decision of this court this question did not directly arise nor was it decided. On the other hand, in this court, *Sharma's* case,[7] held that the protection under Article 20(3) of the Constitution is available to a person against whom a formal accusation had been levelled, inasmuch as a first information report had been lodged against him. *Sharma's* case, therefore, did not decide anything to the contrary of what this Court said in *Mohammed Dastagir v State of Madras*[8] The latter decision in our opinion lays down the law correctly.

In order to bring the evidence within the inhibitions of clause (3) of Article 20, it must be shown not only that the person making the statement was an accused at the time he made it and that it had a material bearing on the criminality of the maker of the statement, but also that he was compelled to make that statement. 'Compulsion' in the context' must mean what in law is called 'duress'. In *The Dictionary of English Law* by Earl Jowitt, 'duress' is explained as follows:—

> *Duress is where a man is compelled to do an act by injury, beating or unlawful imprisonment (sometimes called duress in a strict sense) or by the threat of being killed, suffering some grievous bodily harm, or being unlawfully imprisoned (sometimes called menace, or duress 'permines'). Duress also includes threatening, beating or imprisonment of the wife, parent or child of a person.*

The compulsion in this sense is a physical objective act and not the state of mind of the person making the statement, except where the mind has been so conditioned by some extraneous process as to render the making of the statement involuntary and, therefore, exhorted. Hence, the mere asking by a police officer investigating a crime against a certain individual to do a certain thing is not compulsion within the meaning of Article 20(3). Hence, the mere fact that the accused person, when he made the statement in question was in police custody would not, by itself, be the foundation for an inference of law that the accused was compelled to make the statement. Of course, it is open to an accused person to show that while he was in police custody at the relevant time, he was subjected to treatment which, in the circumstances of the case, would lend itself to the inference that compulsion was in fact exercised. In other words, it will be a question of fact in each case to be determined by the court on weighing the facts and circumstances disclosed in the evidence before it.

7. AIR 1954 SC 300.
8. AIR 1960 SC 756.

In view of these considerations, we have come to the following conclusions:—

1. ***An accused person cannot be said to have been compelled to be a witness against himself simply because he made a statement while in police custody, without anything more. In other words, the mere fact of being in police custody at the time when the statement in question was made would not, by itself, as a proposition of law, lend itself to the inference that the accused was compelled to make the statement, though that fact, in conjunction with other circumstances disclosed in evidence in a particular case, would be a relevant consideration in an enquiry whether or not the accused person had been compelled to make the impugned statement.***
2. ***The mere questioning of an accused person by a police officer, resulting in a voluntary statement, which may ultimately turn out to be incriminatory, is not 'compulsion'.***
3. ***To be a 'witness' is not equivalent to 'furnishing evidence' in its widest significance; that is to say, as including not merely making of oral or written statements but also the production of documents or giving materials which may be relevant at a trial to determine the guilt or innocence of the accused.***
4. ***Giving thumb impressions or impressions of foot or palm or fingers or specimen writings or showing parts of the body by way of identification are not included in the expression 'to be a witness.'***
5. ***To be a witness means imparting knowledge in respect of relevant facts by an oral statement or a statement in writing, made or given in court or otherwise.***
6. ***To be a witness in its ordinary grammatical sense means giving oral testimony in court. Case-law has gone beyond this strict literal interpretation of the expression which may now bear a wider meaning, namely, bearing testimony in court or out of court by a person accused of an offence, orally or in writing.***
7. ***To bring the statement in question within the prohibition of Article 20(3), the person accused must have stood in the character of an accused person at the time he made the statement. It is not enough that he should become an accused, any time after the statement has been made.***

37.1.1 Minority Judgment

We can, therefore, find no justification for thinking that "to be a witness" in Article 20(3) means to impart personal knowledge and find no reason for departing from what this court said in *Sharma's* case[9], that 'to be a witness' is nothing more than 'to furnish evidence", and such evidence can be furnished through lips or by production of a thing or of a document or in other modes.

The question then is: Is an accused person furnishing evidence when he is giving his specimen handwriting or impressions of his fingers or palm or foot?

It appears to us that he is. For these are relevant facts, within the meaning of section 9 and section 11 of the Evidence Act. Just as an accused person is furnishing evidence and by doing so, is being a witness when he makes a statement that he did something, or saw something, so also he is giving evidence and so is being a "witness" when he produces a letter the contents of which are relevant under section 10, or is producing the plan of a house where a burglary has been committed, or is giving his specimen handwriting or impressions of his finger, palm or foot. It has to be noticed, however, that Article 20(3) does not say that an accused person

9. AIR 1954 SC 300.

shall not be compelled to be a witness. It says that such a person shall not be compelled to be a witness against himself. The question that arises, therefore, is: Is an accused person furnishing evidence against himself, when he gives his specimen handwriting, or impressions of his fingers, palm or foot? The answer to this must, in our opinion, be in the negative.

The matter becomes clear, when we contrast the giving of such handwriting or impressions, with, say, the production of a letter admissible in evidence under section 10 or the production of the plan of a burgled house. In either of these two latter cases, the evidence given tends by itself to incriminate the accused person. But the evidence of specimen handwriting or the impressions of the accused person's fingers, palm or foot, will incriminate him, only if on comparison of these with certain other handwritings or certain other impressions, the identity between the two sets is established. By themselves, these impressions or the handwritings do not incriminate the accused person, or even tend to do so. That is why it must be held that by giving these impressions or specimen handwriting, the accused person does not furnish evidence against himself. So, when an accused person is compelled to give a specimen handwriting or impressions of his finger, palm or foot, it may be said that he has been compelled to be a witness; it cannot, however, be said that he has been compelled to be a witness against himself.

This view, it may be pointed out, does not in any way militate against the policy underlying the rule against 'testimonial compulsion' we have already discussed above. There is little risk, if at all, in the investigator or the prosecutor being induced to lethargy or inaction because he can get such handwriting or impressions from an accused person. For, by themselves they are of little or of no assistance to bring home the guilt of an accused. Nor is there any chance of the accused to mislead the investigator into wrong channels by furnishing false evidence. For, it is beyond his power to alter the ridges or other characteristics of his hand, palm or finger or to alter the characteristics of his handwriting.

We agree, therefore, with the conclusion reached by the majority of the Bench that there is no infringement of Article 20(3) of the Constitution by compelling an accused person to give his specimen handwriting or signature; or impressions of his fingers, palm or foot to the investigating officer or under orders of a court for the purpose of comparison under the provisions of section 73 of the Indian Evidence Act; though we have not been able to agree with the view of our learned Brethren that 'to be a witness' in article 20(3) should be equated with the imparting of personal knowledge or that an accused does not become a witness when he produces some document not in his own handwriting even though it may tend to prove facts in issue or relevant facts against him.

37.2 EXPERT EVIDENCE[10] u/s 45, IEA

Author's Summary

The Apex Court has delineated the elements of expert evidence. Supreme Court said that its first requirement is to decide whether the given evidence is outside the knowledge and experience of layman such as scientific question, where the central role of expert cannot be disputed. The other requirements of the expert evidence are that the expert must be within a recognized field of expertise, the evidence must be based on reliable principles, and the expert must be qualified in that discipline. It stressed that expert evidence is of advisory character to courts and they must form its own assessment on the total evidence.

Highlights italicised

10. *Ramesh Chandra Agrawal v Regency Hospital Ltd*, AIR 2010 SC 806 : 2009 AIR SCW 7038 : (2009) 9 SCC 709.

Relevant Extracts

The law of evidence is designed to ensure that the court considers only that evidence which will enable it to reach a reliable conclusion. *The first and foremost requirement for an expert evidence to be admissible is that it is necessary to hear the expert evidence. The test is that the matter is outside the knowledge and experience of the lay person.* Thus, there is a need to hear an expert opinion where there is a medical issue to be settled. The scientific question involved is assumed to be not within the court's knowledge. Thus, cases where the science involved is highly specialized and perhaps even esoteric, the central role of expert cannot be disputed.

The other requirements for the admissibility of expert evidence are:

(i) that the expert must be within a recognised field of expertise,

(ii) that the evidence must be based on reliable principles, and

(iii) that the expert must be qualified in that discipline.

[See *Errors, Medicine and the Law, Alan Merry and Alexander McCall Smith,* 2001 Ed., Cambridge University Press, p. 178]

(12) Section 45 of the Indian Evidence Act speaks of expert evidence. It reads as under:

45. Opinions of experts – When the Court has to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting or finger-impressions, the opinions upon that point of persons specially skilled in such foreign law, science or art, or in questions as to identity of handwriting or finger impressions, are relevant facts. Such person called experts.

Illustrations

(a) The question is, whether the death of *A* was caused by poison. The opinions of experts as to the symptoms produced by the poison by which *A* is supposed to have died, are relevant.

(b) The question is whether *A*, at the time of doing a certain act, was by reason of unsoundness of mind, in capable of knowing the nature of the act, or that he was doing what was either wrong or contrary to law. The opinions of experts upon the question whether the symptoms exhibited by *A* commonly show unsoundness of mind, and whether such unsoundness of mind usually renders persons incapable of knowing the nature of the acts which they do, or knowing that what they do is either wrong or contrary to law, are relevant.

(c) The question is, whether a certain document was written by *A*. Another document is produced which is proved or admitted to have been written by *A*. The opinion of experts on the question whether the two documents were written by the same person or by different persons are relevant. The importance of the provision has been explained in the case of *State of Himachal Pradesh v Jai Lal*, (1999) 7 SCC 280. It is held, that, section 45 of the Evidence Act which makes opinion of experts admissible lays down, that, when the court has to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting or finger impressions, the opinions upon that point of persons specially skilled in such foreign law, science or art, or in questions as to identity of handwriting, or finger impressions are relevant facts.

Therefore, in order to bring the evidence of a witness as that of an expert it has to be shown that he has made a special study of the subject or acquired a special experience therein or in other words that he is skilled and has adequate knowledge of the subject. It is not the province of the expert to act as a Judge or Jury. It is stated in Titli v Jones, AIR 1934 All 237, that the real function of the expert is to put before the court all the materials, together with reasons which induce him to come to the conclusion, so that the court, although not an expert, may form its own judgment by its own observation of those materials. An expert is not a witness of fact and his evidence is really of an advisory character. The duty of an expert witness is to furnish the Judge with the necessary scientific criteria for testing the accuracy of the conclusions so as

to enable the Judge to form his independent judgment by the application of these criteria to the facts proved by the evidence of the case. The scientific opinion evidence, if intelligible, convincing and tested becomes a factor and often an important factor for consideration along with other evidence of the case.

The credibility of such a witness depends on the reasons stated in support of his conclusions and the data and material furnished which form the basis of his conclusions. (See Malay Kumar Ganguly v Dr. Sukumar Mukherjee) [Criminal Appeal Nos. 1191-1194 of 2005 alongwith Civil Appeal No. 1727 of 2007, decided on 7-8-2009].

(16) In the case of *State of Maharashtra v Damu Gopinath Shinde,* 2000 AIR SCW 1617 : 2000 Cr LJ 2301 : AIR 2000 SC 1691 (1700), it has been laid down that without examining the expert as a witness in Court, no reliance can be placed on opinion alone. In this regard, it has been observed in *State (Delhi Administration) v Pali Ram,* AIR 1979 SC 14 : 1979 Cr LJ 17 : (1979) 2 SCC 158 that "no expert would claim today that he could be absolutely sure that his opinion was correct, expert depends to a great extent upon the materials put before him and the nature of question put to him."

(17) In the Article "Relevancy of Expert's Opinion" ***it has been opined that the value of expert opinion rests on the facts on which it is based and his competency for forming a reliable opinion. The evidentiary value of the opinion of expert depends on the facts upon which it is based and also the validity of the process by which the conclusion is reached. Thus, the idea that is proposed in its crux means that the importance of an opinion is decided on the basis of the credibility of the expert and the relevant facts supporting the opinion so that its accuracy can be cross checked. Therefore, the emphasis has been on the data on basis of which opinion is formed. The same is clear from following inference: "Mere assertion without mentioning the data or basis is not evidence, even if it comes from expert. Where the experts give no real data in support of their opinion, the evidence even though admissible, may be excluded from consideration as affording no assistance in arriving at the correct value."***

37.3 "SCIENCE" AND "ART" EVIDENCE[11] u/s 45 INDIAN EVIDENCE ACT

Author's Summary

The SC has stressed that the ramifications of the word **'science'** and **'art'** are wide:

"each of the words 'science' and 'art' has to be construed widely to include within its ambit the opinion of an expert in each branch of these subjects, wherever the court has to form an opinion *upon a point relating to any aspect of science or art."*

Highlights italicised

Relevant Extracts

In the Indian Evidence Act, 1872, Chapter II relating to 'Relevancy of Facts' contains sections 5 to 55 and therein under the heading 'Opinions of Third Persons, when relevant' are sections 45 to 51. Section 45 reads thus:

> *Opinions of experts.*—When the court has to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting [or finger impressions] (Ins. by Act 5 of 1899, section 3), the opinions upon that point of persons specially skilled in such foreign law, science or art, [or in questions as to identity of handwriting] (Ins. by Act 18 of 1872, section 4), [or finger impressions] (Ins. by Act 5 of 1899, section 3), are relevant facts.
>
> Such persons are called experts.

11. *State (through CBI/New Delhi) v SJ Choudhary*, AIR 1996 SC 1491 : 1996 AIR SCW 1128 : 1996 Cr LJ 1713.

Illustration (c) to section 45 is as under:

(c) The question is, whether a certain document was written by *A*. Another document is produced which is proved or admitted to have been written by *A*.

The opinions of experts on the question of whether the two documents were written by the same person or by different persons are relevant.

The plain meaning of section 45 is that the court in order to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting, or finger impressions can treat the opinion upon that point of person specially skilled in such foreign law, science or art, or in questions as to identity of handwriting, or finger impressions as relevant facts.

In other words, the opinion of persons specially skilled in such foreign law science, or art, or questions as to the identity of handwriting or finger impression, called experts therein, are relevant facts. The opinion of such experts is admissible in evidence as relevant facts by virtue of section 45 of the Evidence Act.

However, the expression 'science', or in section 45 in addition to the expressions 'foreign law' and 'handwriting' use in the section as originally enacted, and the expression 'finger impressions' inserted in 1899 is sufficient to indicate that the expression 'science, or art' therein is of wide import. This expression 'science, or art' cannot therefore, have a narrow meaning in section 45 and each of the words 'science' and 'art' has to be construed widely to include within its ambit the opinion of an expert in each branch of these subjects, wherever the court has to form an opinion upon a point relating to any aspect of science or art.

The meaning of the word 'science' as understood ordinarily with reference to its dictionary meaning must be attributed to the word as used in section 45 of the Indian Evidence Act. Some of the meanings given in the dictionaries are:

The Oxford Encyclopaedic English Dictionary:

Science... a. systematic and formulated knowledge, esp. of a specified type or on a specified subject (political science), b. the pursuit or principles of this....

The New Shorter Oxford English Dictionary, Vol. 2:

Science..... 2a. Knowledge acquired by study acquaintance with or mastery of a department of learning... 3a. A particular branch of knowledge or study; a recognised department of learning....

Collins Dictionary of the English Language:

Science 1. the systematic study of the nature and behaviour of the material and physical universe, based on observation, experiment, and measurement, and the formulation of laws to describe these facts in general terms. 2. the knowledge so obtained or the practice of obtaining it. 3. any particular branch of this knowledge: the pure and applied sciences. 4. any body of knowledge organised in a systematic manner. 5. skill or technique...

37.4 EXPERT VERSUS OCULAR EVIDENCE[12]

Author's Summary

It is a case of murder where the IO and the Medico-legal doctor showed extreme degree of dereliction of duty. The IO lost the material evidence. The doctor refused to record injuries on the person of the deceased. SC felt that the dereliction of duties was deliberate. They discarded their evidence.

The eyewitness evidence was reliable and sufficient. They convicted the culprit. On the eyewitness accounts. SC wrote to government to take action against the derelicts.

Highlights italicised

12. *Dayal Singh v State of Uttaranchal,* AIR 2012 SC 3046 : (2012) 8 SCC 263 : 2012 Cr LJ 4323. [DOJ: 3-8-2012].

Relevant Extracts (Verbatim)

There were three injuries on the person of the deceased, Pyara Singh and prepared Inquest Report *vide* Ex. Ka-6 recording his opinion that the deceased died on account of the injuries found on his body. After preparing the site plan, Ext. Ka-10, he also wrote a letter to the Superintendent, Civil Hospital, Haldwani for post-mortem, being Exhibit Ka-9. The dead body was taken to the said hospital by Constable Chandrapal Singh, PW 7. Dr. C.N. Tewari, PW-3, a medical officer in the Civil Hospital, Haldwani, performed the post-mortem upon the body of the deceased and did not find any ante-mortem or post-mortem injuries on the dead body. On internal examination, he did not find any injuries and could not ascertain the cause of death. Further, he preserved the viscera and gave the post-mortem report, Exhibit Ka-4. After noticing that there was no injury or abnormality found upon external and internal examination of the dead body, the doctor in his report recorded as under:

> Viscera in sealed jars handed over to the accompanying Constables.
>
> Jar No. 1 sample preservative saline water.
>
> Jar No. 2 Pieces of stomach
>
> Jar No. 3 Pieces of liver, spleen and kidney.
>
> Death occurred about one day back.
>
> Cause of death could not be ascertained. Hence, viscera preserved.

It appears from the record that the deceased's viscera, which allegedly was handed over by doctor to the police, was either never sent to the Forensic Science Laboratory (for short, the 'FSL') for chemical examination, or if sent, the report thereof was neither called for nor proved before the Court. In fact, this has been left to the imagination of the Court. Considering the ocular and other evidence produced by the prosecution, the learned trial court *vide* its judgment of conviction and order of sentence, both dated 29th June, 1990, found the accused persons guilty of offences under section 302 read with section 34 IPC as well as under section 323 read with section 34 IPC. The trial court, while dealing with the arguments of the accused for application of section 34, as well as the submission that the witnesses had not attributed specific role to the respective accused persons, held as under:

> The attack was premeditated and the accused had come fully prepared to do the overt act. The injury was caused on the head of the deceased which is a vital part of the body at which it was aimed by employing lathi, it was clear that the accused persons had intended to cause death by giving blow on vital part of the body of the deceased. After receiving the injuries, the deceased fell down and even thereafter he was attacked by the accused persons and he died on the spot immediately. The expert witness is expected to put before the Court all materials inclusive of the data which induced him to come to the conclusion and enlighten the court on the technical aspect of the case by examining the terms of science, so that the court, although not an expert, may form its own judgment on those materials after giving due regard to the expert's opinion, because once the expert opinion is accepted, it is not the opinion of the medical officer but that of the Court. See *Madan Gopal Kakkad v Naval Dubey*, (1992) 2 SCR 921 : (1992) 3 SCC 204 : 1992 AIR SCW 1480].

31. Profitably, a reference to the value of an expert in the eye of law can be assimilated as follows:

> *The essential principle governing expert evidence is that the expert is not only to provide reasons to support his opinion but the result should be directly demonstrable. The court is not to surrender its own judgment to that of the expert or delegate its authority to a third party, but should assess his evidence like any other evidence. If the report of an expert is slipshod,*

inadequate or cryptic and the information of similarities or dissimilarities is not available in his report and his evidence in the case, then his opinion is of no use. It is required of an expert whether a government expert or private, if he expects, his opinion to be accepted to put before the court the material which induces him to come to his conclusion so that the court though not an expert, may form its own judgment on that material. If the expert in his evidence as a witness does not place the whole lot of similarities or dissimilarities, etc., which influence his mind to lead him to a particular conclusion which he states in the court then he fails in his duty to take the court into confidence. The court is not to believe the ipse dixit *of an expert. Indeed the value of the expert evidence consists mainly on the ability of the witness by reason of his special training and experience to point out the court such important facts as it otherwise might fail to observe and in so doing the court is enabled to exercise its own view or judgment respecting the cogency of reasons and the consequent value of the conclusions formed thereon. The opinion is required to be presented in a convenient manner and the reasons for a conclusion based on certain visible evidence, properly placed before the Court. In other words the value of expert evidence depends largely on the cogency of reasons on which it is based.*

[See: *Forensic Science in Criminal Investigation & Trial* (4th Edn) by B.R. Sharma]

32. The purpose of expert testimony is to provide the Trier of fact with useful, relevant information. The overwhelming majority rule in the United States, is that an expert need not be a member of a learned profession. Rather, experts in the United States have a wide range of credentials and testify regarding a tremendous variety of subjects based on their skills, training, education or experience. The role of the expert is to apply or supply specialized, valuable knowledge that lay jurors would not be expected to possess. An expert may present the information in a manner that would be unacceptable with an ordinary witness. The common law tried to strike a balance between the benefits and dangers of expert testimony by allowing expert testimony to be admitted only if the testimony were particularly important to aid the trier of fact. Even in the United States, if the helpfulness of expert testimony is substantially outweighed by the risk of unfair prejudice, confusion or waste of time, then the testimony should be excluded under the relevant Rules, and State equally balanced. Expert testimony on any issue of fact and significance of its application has been doubted by the scholars in the United States. Even under the law prevalent in that country, the opinion of an expert has to be scientific, specific and experience based. Conflict in expert opinions is a well prevalent practice there. The skill and experience of an expert is the ethos of his opinion, which itself should be reasoned and convicting. Not to say that no purview would be possible, but if the view of the expert has to find due weightage in the mind of the Court, it has to be well authorised and convincing.

Dr. C.N. Tewari was expected to prepare the post-mortem report with appropriate reasoning and not leave everything to the imagination of the Court. He created a serious doubt as to the very cause of death of the deceased. His report apparently shows an absence of skill and experience and was, in fact, a deliberate attempt to disguise the investigation.

We really need not reiterate various judgments, which have taken the view that the purpose of an expert opinion is primarily to assist the Court in arriving at a final conclusion. Such report is not binding upon the Court. The Court is expected to analyse the report, read it in conjunction with the other evidence on record and then form its final opinion as to whether such report is worthy of reliance or not. Just to illustrate this point of view, in a given case, there may be two diametrically contradictory opinions of handwriting experts and both the opinions may be well reasoned. In such case, the Court has to critically examine the basis, reasoning, approach and experience of the expert to come to a conclusion as to which of the two reports can be safely relied upon by the Court.

The assistance and value of expert opinion is indisputable, but there can be reports which are, ex facie, incorrect or deliberately so distorted as to render the entire prosecution case unbelievable. But if such eyewitnesses and other prosecution evidence are trustworthy, have credence and are consistent with the eye version given by the eye-witnesses, the Court will be well within its jurisdiction to discard the expert opinion. An expert report, duly proved, has its evidentiary value but such appreciation has to be within the limitations prescribed and with careful examination by the Court. A complete contradiction or inconsistency between the medical evidence and the ocular evidence on the one hand and the statement of the prosecution witnesses between themselves on the other, may result in seriously denting the case of the prosecution in its entirety but not otherwise.[13]

37.5 EXTENSIVE/EXEMPLARY USE OF FORENSIC SCIENCE[14]

(Rarest of the rare cases: Nirbhaya Rape-murder)

Author's Summary

It is a landmark judgment where the judges have utilised Forensic Science extensively for the dissemination of justice in this case of inhuman brutal rape- murder case.

The facts of the case are that the victim Nirbhaya, along with her friend (PW- 1) boarded a bus going to Dwarka/Palam. They noticed that six persons were already inside the bus. The accused did not allow anyone else to board. The bus moved and the inside lights of the bus were put off. A few minutes later, three persons (identified as accused Ram Singh, Akshay and a juvenile) started to abuse. Pw-1 objected that led to altercation. The two other joined the melee. PW-1 was beaten badly. He became immobile. Nirbhaya was raped by all the six mauled, her so beastly/brutally that she died a few days later, in spite of the best medical help.

The police did an excellent job of locating and using all the available scientific evidence (CCTV footage for the identification of bus, fingerprints, bite marks, hair, DNA to inter-link the victims and the culprits) and presented an airtight case.

All the courts (trial/ high courts and the Supreme Court) appreciated the evidence. They found it **'rarest of the rare cases'** and sentenced them to death, excluding the juvenile.

Highlights italicised

Relevant Extracts (Verbatim)

> The prosecution case, as projected, is that on 16.12.2012, the deceased, 'Nirbhaya' (not her real name), had gone with her friend, the informant, PW- 1, to the PVR situated in Select City Walk Mall, Saket to watch a movie. After the show was over, about 8:30 p.m., they took an auto and reached Munirka bus stand wherefrom they boarded a white coloured chartered bus [DL- 1P-C-0149, Ext.P1] which was bound to Dwarka/Palam Road, as a boy in the bus was calling for commuters for the said destination. As per the version of the informant, PW-1, the friend of the prosecutrix, the bus had yellow and green lines/stripes and the word "Yadav" was written on it.

13. *Madan Gopal Kakkad v Naval Dubey*, 1992 AIR SCW 1480 : (1992) 3 SCC 204 : (1992) 2 SCR 921.
14. *Mukesh v State for NCT Delhi*, Criminal Appeal Nos. 607-608 of 2017, SC, decided on 5 May 2017. Bench: Dipak Misra, R. Banumathi, Ashok Bhushan.
    The Supreme Court has discussed the evidence relating to DNA, Bite Marks, and Fingerprint lucidly, with numerous case citations.

After both of them had entered the bus, they noticed that six persons were already inside the bus, four in the cabin of the driver and two behind the driver's cabin. The deceased and the informant sat on the left side in the row of two-seaters and paid the fare of twenty rupees as demanded. Before they could get the feeling of a safe journey (though not a time-consuming journey), a feeling of lonely suffocation and a sense of danger barged in, for the accused persons did not allow anyone else to board and the bus moved and the lights inside the bus were put off. With the lights being put off, the darkness and the fear of the unexpected darkness ruled.

A few minutes later, three persons (who have been identified as accused Ram Singh, Akshay and a young boy, who has been treated as a juvenile in conflict with the law) came out of the driver's cabin and started to abuse PW- 1. The young companion of the deceased raised opposition to the abuse that led to an altercation which invited the other two who were sitting outside the driver's cabin to join.

The spirit to oppose and the duty to save the prosecutrix had to die down and perilously succumb to the assault by the accused persons with the iron rods that caused injuries to his head, both the legs and other parts of the body and the consequence was that he fell on the floor of the bus to hear the painful cries of the lady who, he knew, was being treated as an object, an article for experimentation and prey to the pervert proclivity of the six but could do nothing except to hear unbearable cries made in agony and pain. His spirit was dead, and bound to.

5. As the prosecution story further unfurls, the two accused persons, namely, Pawan and Vinay, pinned the young man down and robbed the victims of their mobiles besides robbing the informant of his purse carrying a Citi Bank credit card, ICICI Bank Debit Card, his identity card issued by his employer-company, metro card, a sum of rupees one thousand, his Titan Watch, a golden ring studded with jewels and a silver ring studded with pearl, black colour Hush Puppies shoes, black colour Numero Uno jeans, a grey colour pullover and a brown colour blazer. As per the version of the prosecution, PW-1 was carrying two mobiles and the prosecutrix was carrying only one, and the accused snatched away all the three mobiles.

6. The overpowering was not meant to satisfy the avarice. As the accusations proceed, after the informant was overpowered, as it could only have a singular result, the accused persons, namely, Ram Singh, Akshay and the Juvenile in Conflict with Law (JCL) took the prosecutrix to the rear side of the bus and she was raped by them, one after the other.

7. After committing rape, the accused Ram Singh (since deceased), accused Akshay and the JCL came towards the informant, PW-1, and nailed him down; then the accused Vinay and accused Pawan went to the rear side of the bus and committed rape on the prosecutrix, one by one. PW-1 noticed that earlier the bus was moving at fast speed but after sometime, he felt that the speed of the bus was reduced and he saw that the accused Mukesh, who was driving the bus, came near him and hit him with the rod and he also went to the rear side of the bus and raped the prosecutrix.

The prosecutrix was brutally gang raped by the accused one after the other and she was also subjected to unnatural sex. Her private parts and her internal organs were seriously injured by inserting an iron rod and hand in the rectal and vaginal region. As per PW-1, he had heard the cries of the prosecutrix like "chod do, bachao". PW-1 could hear the prosecutrix shouting in a loud oscillating voice. The prosecutrix was carrying a grey colour purse having an Axis Bank ATM card and other belongings.

The accused persons robbed her of her belongings and stripped her. They also took away the clothes of the informant while beating him with iron rods. The accused were exhorting that both the victims be not left alive. The accused then tried to throw both the informant and the prosecutrix out of the moving bus from its rear door but could not open it and so, they brought them to the front door and threw them out of the moving bus at National Highway No. 8, Hotel Delhi 37, Mahipalpur flyover by the side of the road.

8. As indicated earlier, the prosecutrix and PW-1 were noticed by PW-72, Raj Kumar, who heard the voice of 'bachao, bachao' from the left side of the road near a milestone opposite to Hotel Delhi 37. PW-72 saw PW-1 and the prosecutrix sitting naked having blood all around. Immediately thereafter, PW-72, Raj Kumar, informed PW-70, Ram Pal, who was in the Control Room, requesting him to call PCR. PW-70, Ram Pal, of EGIS Infra Management India (P) Limited, dialled 100 No. and even asked his other patrolling staff to reach the spot.

9. About 10:24 p.m., PW-73, H.C. Ram Chander, who was in charge of PCR van Zebra 54, received information about the incident and the lying of victims in a naked condition near the foot of Mahipalpur flyover towards Dhaula Kuan opposite GMR Gate. PW-73 reached the spot and found the victims. He got the crowd dispersed and brought a bottle of water and a bed sheet from the nearby hotel and tore the same into two parts and gave it to both the victims to cover themselves.

Collection of samples and identity of accused persons

32. The blood sample of the informant was collected by Dr. Kamran Faisal, PW-15, Safdarjung Hospital, on 25.12.2012 and was handed over to SI Pratibha Sharma, PW-80, vide seizure memo Ex.PW-15/A by Constable Suresh Kumar, PW-42. Similarly, as mentioned earlier, PW-49, Dr. Rashmi Ahuja, had collected certain samples from the person of the prosecutrix which are reflected in Ex.PW-49/A from point B to B. All the samples were collected by Inspector Raj Kumari, PW-59, vide seizure memo Ex.PW-59/A and were handed over to PW-80, SI Pratibha Sharma, at Safdarjung Hospital in the morning of 17.12.2012.

Also the samples of gangrenous bowels of the prosecutrix were taken on 24.12.2012 and were handed over to SI Gajender Singh, PW-55, who seized the same vide seizure memo Ex.PW-11/A. All the samples were deposited with the MHC(M) and were not tampered with in any manner. A specimen of scalp hair of the prosecutrix was also taken on 24.12.2012 by Dr. Ranju Gandhi, PW-29, and was handed over to PW- 80, SI Pratibha Sharma, vide seizure memo Ex.PW-29/A.

33. The accused were also subjected to medical examination and samples were taken from their person which were sent for DNA analysis.

34. *DNA analysis was done at the behest of PW-45, Dr. B.K. Mohapatra, Sr. Scientific Officer, Biology, CFSL, CBI, and Biological Examination and DNA profiling reports were prepared which are exhibited as Ex. PW-45/A-C. The report, after analysing the DNA profiles generated from the known samples of the prosecutrix, the informant, and each of the accused, concluded that: "An analysis of the above shows that the samples were authentic and established the identities of the persons mentioned above beyond reasonable doubt."*

35. On 17.12.2012 and 18.12.2012, a team of experts from the CFSL went to Thyagraj Stadium and ***lifted chance prints from the bus*** in question, Ex.P-1. On 28.12.2012, PW-78, Inspector Anil Sharma of P.S. Vasant Vihar, the then S.H.O. of Police Station Vasant Vihar, requested the Director, CFSL, for taking digital palm prints and foot prints of all the accused persons vide his letter Ex.PW-46/C. Pursuant to the said request made by PW-78, Inspector Anil Sharma, the CFSL, on 31.12.2012, took the finger/palm prints and foot prints of the accused persons at Tihar Jail.

After comparing the chance prints lifted from the bus with the finger prints/palm prints and foot prints of all the accused persons, PW-46, Shri A.D. Shah, Senior Scientific Officer (Finger Prints), CFSL, CBI submitted his report Ex.PW- 46/D. In the report, the chance prints of accused Vinay Sharma were found to have matched with those on the bus in question.

36. ***Bite mark analysis*** was also undertaken by the investigative team to establish the identity and involvement of the accused persons. PW-66, Asghar Hussain, on the instructions of the I.O., S.I. Pratibha Sharma, had taken 10 photographs of different parts of the body of the prosecutrix at SJ Hospital on 20.12.2012 between 4:30 p.m. and 5:00 p.m. which were marked as Ex.PW-66/B (Colly.) [10 photographs of 5" x 7" each] and Ex.PW-66/C (Colly.) [10 photographs of 8" x 12" each]. PW-66 also proved in Court the

certificate provided by him in terms of Section 65-B of the Evidence Act in respect of the photographs, Ex. PW-66/A.

Thereafter, PW-18, SI Vishal Choudhary, collected the photographs and the dental models from Safdarjung Hospital on 01.01.2013 and duly deposited the same in the malkhana after he, PW-18, had handed them over to the S.H.O. Anil Sharma, PW-78. The same were later entrusted to S.I. Vishal Choudhary, PW-18 on 02.01.2013, which is proved vide RC No.183/21/12 and exhibited as Ex.PW-77/V. PW-71, Dr. Ashith B. Acharya, submitted the final report in this regard which is exhibited as Ex. PW-71/C. In the said report, he has concluded that at least three bite marks were caused by accused Ram Singh whereas one bite mark has been identified to have been most likely caused by accused Akshay.

Thereafter, on 03.01.2013, the report of the CFSL was received. In fact, the trial court had assured itself of the correct identification of the bus by playing the said CCTV footage shown in the pen drive, Ex.PW-67/1, and the CD, Ex.PW-67/2, during the cross-examination of PW-67, Pramod Jha.

98. Learned counsel Mr. Singh has asserted that bus, Ex. P-1, has been falsely implicated in the present case as is evidenced from the recovery of the CCTV footage. In an attempt to discredit the CCTV footage, he pointed out that only the CCTV recording alleged to be of this bus was recorded and not of all other white buses that had 'Yadav' written on them. The learned counsel for the defence subsequently maintained that the CCTV footage cannot be relied upon as the same has been tampered with by the investigating officers.

99. PW-76, Gautam Roy, HOD, Computer Cell, Forensic Division, has testified that on 02.01.2013, he had received two sealed parcels sealed with the seal of PS and the seals tallied with the specimen seals provided. He marked the blue coloured pen drive found in parcel No.1 as Ex.1 and the Moser Baer CD found in the second parcel as Ex.2. He further testified that both the exhibits were played by him on the computer and the bus was seen twice, at 9:34 p.m. and 9:54 p.m.

He had photographed all these three by freezing the pen drive and the CD and these photographs were compared by him with the photographs taken by the photographer, PW-79, P.K. Gottam, which he had summoned. The witness testified that he had prepared the three comparison charts in this regard as Ex.PW-76/B, PW-76/C and PW-76/D, and his detailed report as Ex.PW-76/E.

The footage taken in a CD and pen drive was sealed in PW-67's presence and as the recording was automatic data being fed on regular basis into the hard disk, the question of tampering with the same could not arise. PW-79, P.K. Gottam, from CFSL, CBI, has stated in his examination that he took photographs of the bus bearing No.DL- 1P-C-0149 parked at Thyagraj Stadium, INA, New Delhi from different angles on 17.12.2012 and 18.12.2012 and handed over the same to PW-76. The said photographs were marked as B1 in Ex.PW-76/B; as C1 and C2 in Ex.PW-76/C; and as D1 in Ex.PW-76/D. He has deposed as to the genuineness of the photographs by deposing that the software used for developing the photographs was tamper proof.

100. Once it is proved before the court through the testimony of the experts that the photographs and the CCTV footage are not tampered with, there is no reason or justification to perceive the same with the lens of doubt. The opinion of the CFSL expert contained in the CFSL report marked as Ex.PW-76/E authenticates that there was no tampering or editing in both the exhibits, Ex.P-67/1 and Ex.P- 67/2, and that a bus having identical patterns as the one parked at Thyagraj Stadium is seen in the CCTV footage, which includes the word "Yadav" written on one side, "back side dent (left)" and absence of wheel cover on the front left side. The contents of the report is also admitted to be true by its author, PW-76, Gautam Roy. Quite apart from that, it is perceptible that the High Court, in order to satisfy itself, had got the CCTV footage played during the hearing and found the same to be creditworthy and acceptable. 157.

207. Having dealt with the aspect pertaining to insertion of rod, it is apposite to advert to the medical evidence and post mortem report. We have, while dealing with other

aspects, referred to certain aspects including **DNA analysis** of medical evidence but the same requires to be critically dealt with as the prosecution has placed heavy reliance upon it.

208. DNA is the abbreviation of Deoxyribo Nucleic Acid. It is the basic genetic material in all human body cells. It is not contained in red blood corpuscles. It is, however, present in white corpuscles. It carries the genetic code. DNA structure determines human character, behaviour and body characteristics. DNA profiles are encrypted sets of numbers that reflect a person's DNA makeup which, in forensics, is used to identify human beings. DNA is a complex molecule. It has a double helix structure which can be compared with a twisted rope 'ladder'.

209. The nature and characteristics of DNA had been succinctly explained by Lord Justice Phillips in Regina v Alan James Doheny & Gary Adams[83]. In the above case, the accused were convicted relying on results obtained by comparing DNA profiles obtained from a stain left at the scene of the crime with DNA profiles obtained from a sample of blood provided by the appellant. In the above context, with regard to DNA, the following was stated by Lord Justice Phillips: "Deoxyribonucleic acid, or DNA, consists of long ribbon-like molecules, the chromosomes, 46 of which lie tightly coiled in nearly every cell of the body. These chromosomes - 23 provided from the mother and 23 from the father at conception, form the genetic blueprint of the body. Different sections of DNA have different identifiable and discrete characteristics.

When a criminal leaves a stain of blood or semen at the scene of the crime it may prove possible to extract from that crime stain sufficient sections of DNA to enable a comparison to be made with the same sections extracted from a sample of blood provided by the suspect. This process is complex and we could not hope to describe it more clearly or succinctly than did Lord Taylor C.J. in the case of Deen (transcript: December 21, 1993), so we shall gratefully adopt his description. "The process of DNA profiling starts with DNA being extracted from the crime stain and also from a sample taken from the suspect. In each case the DNA is cut into smaller lengths by specific enzymes. The fragments produced are sorted according to size by a process of electrophoresis.

This involves placing the fragments in a gel and drawing them electromagnetically along a track through the gel. The fragments with smaller molecular weight travel further than the heavier ones. The pattern thus created is transferred from the gel onto a membrane. Radioactive DNA probes, taken from elsewhere, which bind with the sequences of most interest in the sample DNA are then applied. After the excess of the DNA probe is washed off, an X-ray film is placed over the membrane to record the band pattern. This produces an auto radiograph which can be photographed. When the crime stain DNA and the sample DNA from the suspect have been run in separate tracks through the gel, the resultant auto-radiographs can be compared. The two DNA profiles can then be said either to match or not.""

210. In the United States, in an early case Frye v United States[84], it was laid down that scientific evidence is admissible only if the principle on which it is based is substantially established to have general acceptance in the field to which it belonged. The US Supreme Court reversed the above formulation in Daubert v Merrell Dow Pharmaceuticals, Inc.[85] stating thus: "11. Although the Frye decision itself focused exclusively on "novel" scientific techniques, we do not read the requirements of Rule 702 to apply specially or exclusively to unconventional evidence. Of course, well- established propositions are less likely to be challenged than those that are novel, and they are more handily defended. Indeed, theories that are so firmly established as to have attained the status of scientific law, such as the laws of thermodynamics, properly are subject to judicial notice under Fed.Rule Evid.201.

13. This is not to say that judicial interpretation, as opposed to adjudicative fact finding, does not share basic characteristics of the scientific endeavour: "The work of a judge is in one sense enduring and in another ephemeral... In the endless process of testing and retesting, there is a constant rejection of the dross and a constant retention of whatever is pure and sound and fine." B.Cardozo, The nature of the Judicial Process 178, 179 (1921)."

211. The principle was summarized by Blackmun, J., as follows: "To summarize: "general acceptance" is not a necessary precondition to the admissibility of scientific evidence under

the Federal Rules of Evidence, but the Rules of Evidence-especially Rule 702-do assign to the trial judge the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand. Pertinent evidence based on scientifically valid principles will satisfy those demands. The inquiries of the District Court and the Court of Appeals focused almost exclusively on "general acceptance," as gauged by publication and the decisions of other courts. Accordingly, the judgment of the Court of Appeals is vacated and the case is remanded for further proceedings consistent with this opinion."

212. After the above judgment, the DNA Test has been frequently applied in the United States of America. In District Attorney's Office for the Third Judicial District et al. v William G. Osborne[86], Chief Justice Roberts of the Supreme Court of United States, while referring to the DNA Test, stated as follows: "DNA testing has an unparalleled ability both to exonerate the wrongly convicted and to identify the guilty. It has the potential to significantly improve both the criminal justice system and police investigative practices.

The Federal Government and the States have recognized this, and have developed special approaches to ensure that this evidentiary tool can be effectively incorporated into established criminal procedure-usually but not always through legislation. ... ... Modern DNA testing can provide powerful new evidence unlike anything known before. Since its first use in criminal investigations in the mid- 1980s, there have been several major advances in DNA technology, culminating in STR technology. It is now often possible to determine whether a biological tissue matches a suspect with near certainty. While of course many criminal trials proceed without any forensic and scientific testing at all, there is no technology comparable to DNA testing for matching tissues when such evidence is at issue."

213. DNA technology as a part of Forensic Science and scientific discipline not only provides guidance to the investigation but also supplies the Court accrued information about the tending features of identification of criminals. The recent advancement in modern biological research has regularized Forensic Science resulting in radical help in the administration of justice. In our country also like several other developed and developing countries, DNA evidence is being increasingly relied upon by courts. After the amendment in the Criminal Procedure Code by the insertion of Section 53A by Act 25 of 2005, DNA profiling has now become a part of the statutory scheme. Section 53A relates to the examination of a person accused of rape by a medical practitioner.

214. Similarly, under Section 164A inserted by Act 25 of 2005, for medical examination of the victim of rape, the description of material taken from the person of the woman for DNA profiling is must. Section 53A sub-section (2) as well as Section 164(A) sub-section (2) are to the following effect:

"Section 53A. Examination of person accused of rape by Medical Practitioner.-

(1) ... ...

(2) The registered medical practitioner conducting such examination shall, without delay, examine such person and prepare a report of his examination giving the following particulars, namely:- the name and address of the accused and of the person by whom he was brought, the age of the accused, marks of injury, if any, on the person of the accused, the description of material taken from the person of the accused for DNA profiling, and other material particulars in reasonable detail. Section 164A. Medical Examination of the victim of rape.-

(1) ... ...

(2) The registered medical practitioner, to whom such woman is sent, shall, without delay, examine her person and prepare a report of his examination giving the following particulars, namely:- the name and address of the woman and of the person by whom she was brought; the age of the woman; the description of material taken from the person of the woman for DNA profiling; marks of injury, if any, on the person of the woman; general mental condition of the woman; and other material particulars in reasonable detail."

215. This Court had the occasion to consider various aspects of DNA profiling and DNA reports. K.T. Thomas, J. in *Kamti Devi (Smt.) v Poshi Ram*[87], observed:

"10. We may remember that Section 112 of the Evidence Act was enacted at a time when the modern scientific advancements with deoxyribonucleic acid (DNA) as well as ribonucleic acid (RNA) tests were not even in contemplation of the legislature. The result of a genuine DNA test is said to be scientifically accurate. ..."

216. In *Pantangi Balarama Venkata Ganesh v State of Andhra Pradesh*[88], a two-Judge Bench had explained as to what is DNA in the following manner:

"41. Submission of Mr Sachar that the report of DNA should not be relied upon, cannot be accepted. What is DNA? It means: "Deoxyribonucleic acid, which is found in the chromosomes of the cells of living beings is the blueprint of an individual. DNA decides the characteristics of the person such as the colour of the skin, type of hair, nails and so on. Using this genetic fingerprinting, identification of an individual is done like in the traditional method of identifying fingerprints of offenders.

The identification is hundred per cent precise, experts opine." There cannot be any doubt whatsoever that there is a need for quality control. Precautions are required to be taken to ensure preparation of high molecular weight DNA, complete digestion of the samples with appropriate enzymes, and perfect transfer and hybridisation of the blot to obtain distinct bands with appropriate control. (See article of Lalji Singh, Centre for Cellular and Molecular Biology, Hyderabad in DNA profiling and its applications.) But in this case there is nothing to show that such precautions were not taken.

42. Indisputably, the evidence of the experts is admissible in evidence in terms of Section 45 of the Evidence Act, 1872. In cross-examination, PW 46 had stated as under: "If the DNA fingerprint of a person matches with that of a sample, it means that the sample has come from that person only. The probability of two persons except identical twins having the same DNA fingerprint is around 1 in 30 billion world population.""

217. In Santosh Kumar Singh v State Through CBI[89], which was a case of a young girl who was raped and murdered, the DNA reports were relied upon by the High Court which was approved by this Court and it was held thus:

"71. We feel that the trial court was not justified in rejecting the DNA report, as nothing adverse could be pointed out against the two experts who had submitted it. We must, therefore, accept the DNA report as being scientifically accurate and an exact science as held by this Court in Kamti Devi v Poshi Ram (supra). In arriving at its conclusions the trial court was also influenced by the fact that the semen swabs and slides and the blood samples of the appellant had not been kept in proper custody and had been tampered with, as already indicated above. We are of the opinion that the trial court was in error on this score. We, accordingly, endorse the conclusions of the High Court on Circumstance 9."

218. In Inspector of Police, Tamil Nadu v John David[90], a young boy studying in MBBS Course was brutally murdered by his senior. The torso and head were recovered from different places which were identified by the father of the deceased. For confirming the said facts, the blood samples of the father and mother of the deceased were taken which were subject to DNA test. From the DNA, the identification of the deceased was proved. Paragraph 60 of the decision is reproduced below: "60. ... The said fact was also proved from the DNA test conducted by PW 77. PW 77 had compared the tissues taken from the severed head, torso and limbs and on scientific analysis he has found that the same gene found in the blood of PW1 and Baby Ponnusamy was found in the recovered parts of the body and that therefore they should belong to the only missing son of PW 1."

219. In *Krishan Kumar Malik v State of Haryana* [91], in a gang rape case when the prosecution did not conduct DNA test or analysis and matching of semen of the appellant-accused with that found on the undergarments of the prosecutrix, this Court held that after the incorporation of Section 53- A in CrPC, it has become necessary for the prosecution to go in for DNA test in such type of cases. The relevant paragraph is reproduced below:

"44. Now, after the incorporation of Section 53-A in the Cr.P.C w.e.f 23.06.2006, brought to our notice by the learned counsel for the respondent State, it has become necessary for the prosecution to go in for DNA test in such type of cases, facilitating the prosecution to prove its case against the accused. Prior to 2006, even without the aforesaid

specific provision in CrPC the prosecution could have still restored to this procedure of getting the DNA test or analysis and matching of semen of the appellant with that found on the undergarments of the prosecutrix to make it a foolproof case, but they did not do so, thus they must face the consequences."

220. In *Surendra Koli v State of Uttar Pradesh* [92], the appellant, a serial killer, was awarded death sentence which was confirmed by the High Court. While confirming the death sentence, this Court relied on the result of the DNA test conducted on the part of the body of the deceased girl. Para 12 is reproduced below:- "12. The DNA test of Rimpa by CDFD, a pioneer institute in Hyderabad matched with that of blood of her parents and brother. The doctors at AIIMS have put the parts of the deceased girls which have been recovered by the doctors of AIIMS together. These bodies have been recovered in the presence of the doctors of AIIMS at the pointing out by the accused Surendra Koli. Thus, recovery is admissible under Section 27 of the Evidence Act."

221. In Mohammed Ajmal Mohammad Amir Kasab alias Abu Mujahid v State of Maharashtra[93], the accused was awarded death sentence on charges of killing large number of innocent persons on 26th November, 2008 at Bombay. The accused with others had come from Pakistan using a boat 'Kuber' and several articles were recovered from 'Kuber'. The stains of sweat, saliva and other bodily secretions on those articles were subjected to DNA test and the DNA test matched with several accused. The Court observed:

222. In Sandeep v State of Uttar Pradesh[94], the facts related to the murder of pregnant paramour/girlfriend and unborn child of the accused. The DNA report confirmed that the appellant was the father of the unborn child. The Court, relying on the DNA report, stated as follows: "67. In the light of the said expert evidence of the Junior Scientific Officer it is too late in the day for the appellant Sandeep to contend that improper preservation of the foetus would have resulted in a wrong report to the effect that the accused Sandeep was found to be the biological father of the foetus received from the deceased Jyoti.

As the said submission is not supported by any relevant material on record and as the appellant was not able to substantiate the said argument with any other supporting material, we do not find any substance in the said submission. The circumstance, namely, the report of DNA in having concluded that accused Sandeep was the biological father of the recovered foetus of Jyoti was one other relevant circumstance to prove the guilt of the said accused."

223. In Rajkumar v State of Madhya Pradesh[95], the Court was dealing with a case of rape and murder of a 14 year old girl. The DNA report established the presence of semen of the appellant in the vaginal swab of the prosecutrix. The conviction was recorded relying on the DNA report. In the said context, the following was stated:

"8. The deceased was 14 years of age and a student in VIth standard which was proved from the school register and the statement of her father Iknis Jojo (PW1). Her age has also been mentioned in the FIR as 14 years. So far as medical evidence is concerned, it was mentioned that the deceased prosecutrix was about 16 years of age. So far as the analysis report of the material sent and the DNA report is concerned, it revealed that semen of the appellant was found on the vaginal swab of the deceased. The clothes of the deceased were also found having appellant's semen spots. The hair which were found near the place of occurrence was found to be that of the appellant."

224. In *Nandlal Wasudeo Badwaik v Lata Nandlal Badwaik* [96], the appellant, father of the child born to his wife, questioned the paternity of the child on the ground that she did not stay with him for the last two years. The Court directed for a DNA test. The DNA result opined that the appellant was not the biological father of the child. The Court also had the occasion to consider Section 112 of the Evidence Act which raises a presumption that birth during marriage is conclusive proof of legitimacy. The Court relied on the DNA test holding the DNA test to be scientifically accurate. The pertinent observations are extracted below:

"19. The husband's plea that he had no access to the wife when the child was begotten stands proved by the DNA test report and in the face of it, we cannot compel the appellant to bear the fatherhood of a child, when the scientific reports prove to the contrary. We

are conscious that an innocent child may not be bastardised as the marriage between her mother and father was subsisting at the time of her birth, but in view of the DNA test reports and what we have observed above, we cannot forestall the consequence. It is denying the truth. "Truth must triumph" is the hallmark of justice.

20. As regards the authority of this Court in Kamti Devi, this Court on appreciation of evidence came to the conclusion that the husband had no opportunity whatsoever to have liaison with the wife. There was no DNA test held in the case. In the said background i.e. non-access of the husband to the wife, this Court held that the result of DNA test "is not enough to escape from the conclusiveness of Section 112 of the Act."

The judgment has to be understood in the factual scenario of the said case. The said judgment has not held that DNA test is to be ignored. In fact, this Court has taken note of the fact that DNA test is scientifically accurate. We hasten to add that in none of the cases referred to above, this Court confronted with a situation in which a DNA test report, in fact, was available and was in conflict with the presumption of conclusive proof of the legitimacy of the child under Section 112 of the Evidence Act.

In view of what we have observed above, these judgments in no way advance the case of the respondents." From the aforesaid authorities, it is quite clear that DNA report deserves to be accepted unless it is absolutely dented and for non- acceptance of the same, it is to be established that there had been no quality control or quality assurance. If the sampling is proper and if there is no evidence as to tampering of samples, the DNA test report is to be accepted.

225. In order to establish a clear link between the accused persons and the incident at hand, the prosecution has also adduced scientific evidence in the form of DNA, fingerprint and bite mark analysis.

226. Various samples, for the purpose of DNA profiling, were lifted from the person of the prosecutrix; the informant; the accused, their clothes/ articles; the dumping spot; the iron rods; the ashes of partly burnt clothes; as well as from the offending bus. PW-45, Dr. B.K. Mohapatra, analysed the said DNA profiles and submitted his report thereof. In his report, he concluded that the samples were authentic and capable of establishing the identities of the persons concerned beyond reasonable doubt.

Guidelines and methodology documented in the Working Procedure Manuals of the laboratory which have been validated and recommended for use in the laboratory. He further added that once a DNA profile is generated, its accuracy is 100%. The trial court and the High Court have consistently noted that the counsel for the defence did not raise any substantial ground to challenge the DNA report during the cross-examination of PW-45. In such circumstances, there is no reason to declare the DNA report as inaccurate, especially when it clearly links the accused persons with the incident.

227. After establishing the identities of each of the accused persons, the informant and the prosecutrix through DNA analysis, **the DNA profiles** generated from the remaining samples, where the identity of biological material found thereon needed to be ascertained, were matched with the DNA profiles of the prosecutrix, the informant and the accused, generated earlier from known samples. Such an analysis cogently linked each of the accused with the victims as also with the crime scene. A summary of the findings in the report submitted by PW-45, Dr. B.K. Mohapatra, is as under:

"S.No.	Accused	DNA EVIDENCE
1	Ram Singh	Rectal swab from the prosecutrix contained DNA of male origin, which was found consistent with the DNA developed from the blood sample of this accused.
		DNA profile developed from the blood stains from the underwear, T-shirt and slippers of this accused was found consistent with the DNA of the prosecutrix.

"S.No.	Accused	DNA EVIDENCE
2	Mukesh	DNA profile developed from the blood stains from the pants, T-shirt and jacket of this accused was found consistent with the DNA of the prosecutrix.
3	Akshay	Breast swab of the prosecutrix contained DNA of male origin which was found consistent with the DNA of this accused.
		DNA profile developed from the blood stains from the jeans of this accused was found consistent with the DNA of the prosecutrix.
4	Vinay	DNA profile developed from the blood stains from the underwear, jacket and slippers of this accused was found consistent with the DNA of the prosecutrix.
5	Pawan	DNA profile developed from the blood stains from the sweater and shoes and slippers of this accused was found consistent with the DNA of the prosecutrix."

228. Further, a summary of the DNA analysis of the biological samples lifted from the material objects such as the bus, the iron rods, and the ash and unburnt pieces of clothes is also worth producing here:

"Serial No.	Identity of the victim	Findings of DNA Analysis
	Informant	The DNA profile developed from burnt clothes pieces was found to be of male origin and was consistent with the DNA profile of complainant.
		The bunch of DNA profile developed from hair and blood stained pieces of paper recovered from the bus was found consistent with the DNA profile of complainant.
		The DNA profile developed from blood stained dried leaves collected from the place where both the victims were thrown matched with the DNA profile of complainant.
	Prosecutrix	The DNA profile developed from blood stains from both the iron rods recovered at the instance of accused Ram Singh from the bus was of female origin and was consistent with the DNA profile of prosecutrix.
		The DNA profile developed from blood stains from curtains of the bus matched with the DNA profile of prosecutrix.
		The DNA profile developed from blood stains from seat covers was found consistent with the DNA profile of prosecutrix.
		DNA profile developed from blood stains from the bunch of the hair recovered from floor of the bus below sixth row seat, blood stains prepared from the roof of the bus near back gate, blood stains prepared from the floor of the bus near back gate, blood stains taken from side of back stairs of the bus, and blood stains taken from the inner side of the back door of the bus was found consistent with the DNA profile of prosecutrix.

230. Mr. Sharma, learned counsel appearing for appellants - Mukesh and Pawan Kumar Gupta, submitted that in the instant case, the DNA test cannot be treated to be accurate, for there was blood transfusion as the prosecutrix required blood and when there is mixing of blood, the DNA profiling is likely to differ. It is seemly to note, nothing had been put to the expert in his cross-examination in this regard. As the authorities relating to DNA would show, if the quality control is maintained, it is treated to be quite accurate and as the same has been established, we are compelled to repel the said submission of Mr. Sharma.

The evidence relating to finger print analysis:

231. Next aspect that is required to be adverted is the **evidence of fingerprint analysis** adduced by the prosecution to establish the identity of the accused persons. By virtue of the finger print analysis, the prosecution has tried mainly to establish the presence of the accused in the offending bus. On 17.12.2012 and 18.12.2012, a team of experts from the CFSL had lifted chance finger prints from the concerned bus, Ex.P-1, at Thyagraj Stadium. On 28.12.2012, PW-78, Inspector Anil Sharma of P.S. Vasant Vihar, the then S.H.O. of Police Station Vasant Vihar, requested the Director, CFSL for taking digital palm prints and foot prints of all the accused persons vide his letter Ex.PW-46/C. Pursuant to the said request made by PW-78, Inspector Anil Sharma, the CFSL on 31.12.2012 took the finger/palm prints and foot prints of the accused persons at Tihar Jail. After comparing the chance prints lifted from the bus with the finger prints/palm prints and foot prints of all the accused persons, PW-46, Shri A.D. Shah, Senior Scientific Officer (Finger Prints), CFSL, CBI, submitted his report, Ex.PW-46/D.

232. As per the report, Ex.PW-46/D, the result of the aforesaid examination of the Finger Print Division of the CFSL, CBI, New Delhi was that the chance prints of accused Vinay Sharma were found on the bus in question. The relevant portion of the report is as under:

"Result of Examination:

1. The chance print marked as Q.1 is identical with left palmprint specimen of Vinay Sharma S/o Sh. Hari Ram Sharma marked here as LPS-28 on the slip marked here as S.28 (Matching ridge characteristics have been found in their relative positions in the chance palmprint and specimen palm print. This forms the basis of the opinion that these prints are identical. Eight of them have been marked with projected red lines with their detailed description are placed at Annexure-1)

II. The chance print marked as Q.4 is identical with right thumb impression of Vinay Sharma S/o Sh. Hari Ram Sharma marked here as RTS-23 on the slip marked here as S.23 (Matching ridge characteristics have been found in their relative positions in the chance print and specimen finger print. This forms the basis of the opinion that these prints are identical. Eight of them have been marked with projected red lines with their detailed description are placed at Annexure-2)." The above report incontrovertibly proves that accused Vinay was present in the bus at the time of the incident. Be it noted, the other chance prints were found to be unfit for comparison or different from specimen print.

The comparison also shows that there is a concordance in terms of general alignment and angulation of the biting surfaces of the teeth of the lower jaw on the dental models of the accused person with the name Akshay and the corresponding bite marks visible on Photograph No.5. In particular, the comparison revealed concordance between the biting surface of the teeth on the lower jaw of the dental models of the accused person with the name Akshay and the bite mark visible on Photograph No.5 in relation to the rotated left first incisor whose mesial surface pointed towards the tongue.

Overall, the bite mark shows some degree of specificity to the accused person's teeth by virtue of a number of concordant points, including one corresponding unconventional/ individual characteristic. There is an absence of any unexplainable

discrepancies between the bite mark and the biting surfaces of this accused person's teeth. Therefore, the teeth on the dental models of the accused person with the name Akshay probably caused the bite marks visible on Photograph No.5."

239. Be it noted, the present is a case where the victim's body contained various white bite marks. Bite mark analysis play an important role in the criminal justice system. Advanced development of technology such as laser scanning, scanning electron microscopy or cone beam computed tomography in forensic odontology is utilised to identify more details in bite marks and in the individual teeth of the bite. Unlike fingerprints and DNA, bite marks lack the specificity and durability as the human teeth may change over time.

However, bite mark evidence has other advantages in the criminal justice system that links a specific individual to the crime or victim. For a bite mark analysis, it must contain abundant information and the tooth that made the mark must be quite distinctive.

240. Bite marks in the skin are photographed in cases where the suspect is apprehended. A thorough dental combination is administered after dental examination of the suspect. Final comparison of the details of the original mark with the dentation of the suspect is done by experts.

241. The bite marks generally include only a limited number of teeth. The teeth and oral structure of the accused are examined by experts and, thereafter, bite marks are compared and reports are submitted. Forensic Odontology is a science and the most common application of Forensic Odontology is for the purpose of identification of persons from their tooth structure.

242. Forensic Odontology has established itself as an important and indispensable science in medico-legal matters and expert evidence through various reports which have been utilized by courts in the administration of justice. In the case at hand, the report is wholly credible because of matching of bite marks with the tooth structure of the accused persons and there is no reason to view the same with any suspicion. Learned counsel for the appellants would only contend that the whole thing has been stage- managed. We are not impressed by the said submission, for the evidence brought on record cogently establish the injuries sustained by the prosecutrix and there is consistency between the injuries and the report. We are not inclined to accept the hypothesis that bite marks have been managed. Acceptability of the plea of alibi

"**Aggravating circumstances**: A court may, however, in the following cases impose the penalty of death in its discretion:

(a) if the murder has been committed after previous planning and involves extreme brutality; or

(b) if the murder involves exceptional depravity; or

(c) if the murder is of a member of any of the armed forces of the Union or of a member of any police force or of any public servant and was committed-

  (i) while such member or public servant was on duty; or

  (ii) in consequence of anything done or attempted to be done by such member or public servant in the lawful discharge of his duty as such member or public servant whether at the time of murder he was such member or public servant, as the case may be, or had ceased to be such member or public servant; or

(d) if the murder is of a person who had acted in the lawful discharge of his duty under Section 43 of the Code of Criminal Procedure, 1973, or who had rendered assistance to a Magistrate or a police officer demanding his aid or requiring his assistance under Section 37 and Section 129 of the said Code." After reproducing the same, the Court opined: "Stated broadly, there can be no objection to the acceptance of these indicators but as we have indicated already, we would prefer

not to fetter judicial discretion by attempting to make an exhaustive enumeration one way or the other."

333. Thereafter, the Court referred to the suggestions pertaining to mitigating circumstances: "Mitigating circumstances.-In the exercise of its discretion in the above cases, the court shall take into account the following circumstances:

(1) That the offence was committed under the influence of extreme mental or emotional disturbance.

(2) The age of the accused. If the accused is young or old, he shall not be sentenced to death.

(3) The probability that the accused would not commit criminal acts of violence as would constitute a continuing threat to society.

(4) The probability that the accused can be reformed and rehabilitated. The State shall by evidence prove that the accused does not satisfy the conditions (3) and (4) above.

(5) That in the facts and circumstances of the case the accused believed that he was morally justified in committing the offence.

(6) That the accused acted under the duress or domination of another person.

(7) That the condition of the accused showed that he was mentally defective and that the said defect impaired his capacity to appreciate the criminality of his conduct." The Court then observed: "We will do no more than to say that these are undoubtedly relevant circumstances and must be given great weight in the determination of sentence."

357. When we cautiously, consciously and anxiously weigh the aggravating circumstances and the mitigating factors, we are compelled to arrive at the singular conclusion that the aggravating circumstances outweigh the mitigating circumstances now brought on record. Therefore, we conclude and hold that the High Court has correctly confirmed the death penalty and we see no reason to differ with the same.

37.6 BENEFIT OF DOUBT[15]: (PROOF BEYOND REASONABLE DOUBT IS A GUIDELINE, NOT A FETISH.)

Author's Summary

About 90 % criminals committing heinous crime are given benefit of doubt and acquitted, making mockery of the criminal justice. Proof beyond reasonable doubt is a guideline, not a fetish. *A fair doubt is based upon reasons and common sense. It must grow out of the evidence.* The SC, in this case, has quoted chapter and verse from case law that exaggerated devotion to the rule of benefit of doubt must not nurture fanciful doubts or lingering suspicion and thereby destroy social defence.

It is a case of drug trafficking where the traffickers wanted to get the benefit of doubt. SC refused to accept the plea.

Highlights italicised

Relevant Extracts (verbatim)

The facts giving rise to the conviction and sentence of the appellants have been set out in detail by the High Court in the order under appeal hence need not be detailed

15. *Iqbal Moosa Patel v State of Gujarat*, AIR 2011 SC (Supp) 470.

over again except to the extent it is absolutely necessary to do so. Briefly stated the prosecution case is that a certain secret information was received by Mr. K.C. Chudasma, Inspector, Anti-Terrorist Squad which was passed on to Mr. P.S. Tomar, Zonal Director, Narcotics Control Bureau, Ahmedabad. The information suggested that Accused No. 2 Mr. Hemaram Chaudhary was the kingpin of a syndicate involved in smuggling and interstate trafficking of narcotic substances. Accused No. 3 Shri Derajram Jat was the man allegedly carrying out the operations at the instance of the said Mr. Hemaram Chaudhary. The information so received was used to intercept and search a truck bearing registration number RJ-04-G-1305 on 29th June, 2001 at Lal Bahadur Shastri Bridge, Pirana area in the city of Ahmedabad while the same was returning from Bharuch. The truck was driven by accused No. 4-Ashuram Durgaram Choudhary while accused No. 3 Derajram Jat was accompanying him. The search of the truck led to the seizure of psychotropic drugs from the aforesaid two persons who revealed that the consignment in question had been supplied by Mr. Hemaram Choudhary-accused No. 2.

On the basis of the information so collected and the disclosure made by the driver of the truck and Derajram Jat-accused No. 3. Appellant-Iqbal Moosa Patel was taken into custody and his statement under section 67 of the NDPS Act recorded. A raid was then carried out on 7th July, 2001 at village Varadia, Khadaki Street, District Bharuch, which led to the seizure of heroin weighing 3.056 kgs. and cash of Rs. 1,17,500 from the residence of appellant No. 1 Iqbal Moosa Patel. In his statement recorded under section 67 of the N.D.P.S. Act the said accused admitted having purchased four packets of brown sugar from one Master and Bhaikhanbhai both residents of Badmer in Rajasthan in the month of March, 2001, out of which one packet had already been sold to one Shakur while the remaining three were seized by the respondent from his residence as mentioned above.

On the basis of the material placed before the trial court the accused persons were charged with different offences to which the accused pleaded not guilty and claimed a trial.

13. That brings us to the question whether the appellants could be given the benefit of doubt having regard to the nature of the evidence adduced by the prosecution against them. We do not think that the appellants have made out a case for grant of any such benefit.

It is true that the prosecution is required to establish its case beyond a reasonable doubt, but that does not mean that the degree of proof must be beyond a shadow of doubt. The principle as to what degree of proof is required is stated by Lord Denning in his inimitable style in *Miller* v *Minister of Pensions*, (1947) 2 All ER 272 : 177 LT 536 : 63 TLR 474:

> *"That degree is well-settled. It need not reach certainty, but it must carry a high degree of probability. Proof beyond reasonable doubt does not mean proof beyond a shadow of a doubt. The law would fail to protect the community if it permitted fanciful possibilities to deflect the course of justice. If the evidence is so strong against a man as to leave only a remote possibility in his favour which can be dismissed with sentence of course, it is possible but not in the least probable,' the case is proved beyond reasonable doubt....*

It is true that under our existing jurisprudence in a criminal matter, we have to proceed with presumption of innocence, but at the same time, that presumption is to be judged on the basis of conceptions of a reasonable prudent man. Smelling doubts for the sake of giving benefit of doubt is not the law of the land."

14. *Reference may also be made to the decision of this Court in Sucha Singh v State of Punjab,* (2003) 7 SCC 64 : AIR 2003 SC 3617 : 2003 AIR SCW 3984*, where this Court has reiterated the principle in the following words:*

"…… ***Exaggerated devotion to the rule of benefit of doubt must not nurture fanciful doubts or lingering suspicion and thereby destroy the social defence. Justice cannot be made sterile on the plea that it is better to let a hundred guilty escape than punish an innocent letting the guilty escape is not doing justice according to law.*** *[See Gurbachan Singh v Satpal Singh,* AIR 1990 SC 209 : 1990 Cr LJ 562 : JT 1989 (4) SC 38].

Prosecution is not required to meet any and every hypothesis put forward by the accused. A reasonable doubt is not an imaginary, trivial or merely possible doubt, but a fair doubt based upon reason and common sense. It must grow out of the evidence in the case. If a case is proved perfectly, it is argued that it is artificial; if a case has some flaws inevitable because human beings are prone to err, it is argued that it is too imperfect. One wonders whether in the meticulous hypersensitivity to eliminate a rare innocent from being punished, many guilty persons must be allowed to escape.

Proof beyond reasonable doubt is a guideline, not a fetish."

37.7 PROOF 'BEYOND REASONABLE DOUBT'[16]: (USE/MISUSE)

Author's Note

This is a landmark judgment of SC on frequent acquittals. In more than 90% heinous crimes, the criminals are acquitted on the single plea: not proved *'beyond reasonable doubt'*, by doubting Thomases, mostly on unsound grounds; making mockery of Criminal Justice System and promoting lawlessness in the country.

The Apex court has condemned the misuse of the phrase ***'not proved beyond reasonable doubt".***

Highlights italicised

Relevant Extracts (Verbatim)

Even at this stage we may remind ourselves of a necessary social perspective in criminal cases which suffers from sufficient forensic appreciation.

The dangers of exaggerated devotion to the rule of benefit of doubt at the expense of social defence and to the soothing sentiment that all acquittals are always good regardless of justice to the victim and the community, demand especial emphasis in the contemporary context of escalating crime and escape. The judicial instrument has a public accountability. The cherished principles or golden thread of proof beyond reasonable doubt which runs through the web of our law should not be stretched morbidly to embrace every punch, hesitancy and degree of doubt. The excessive solicitude reflected in the attitude that a thousand guilty men may go but one innocent martyr shall not suffer is a false dilemma.

Only reasonable doubts belong to the accused. Otherwise any practical system of justice will then break down and lose credibility with the community. The evil of acquitting a guilty person light-heartedly as a learned author has sapiently observed, goes much beyond the simple fact that just one guilty person has gone unpunished. If unmerited acquittal become general, they tend to lead to a cynical disregard of the law, and this in turn leads to a public demand for harsher legal presumptions against indicted 'persons' and more severe punishment of those who are found guilty. Thus, too frequent acquittals of the guilty may lead to a ferocious penal law, eventually eroding the judicial protection of the guiltless. For all these reasons it is true to say, with Viscount Simon, that

"a miscarriage of justice may arise from acquittal of the guilty no less than from the conviction of the innocent……"

16. *Shivaji Sahebrao Bobade v State of Maharashtra,* AIR 1973 SC 2622 : (1973) 2 SCC 793 : 1973 Cr L J 1783.

37.8 CIRCUMSTANTIAL EVIDENCE[17]

Author's Summary

It is a case of murder. The culprit brought a female with him to Delhi, stayed in a hotel, killed her and left the body in the hotel and vanished from the scene. There were no eyewitnesses to his heinous crime at Delhi. He was convicted on circumstantial evidence. SC maintained the conviction, It did not accept the defence objection to such conviction. SC also laid the law, with support from other similar cases:

1. **"the Courts will be well-advised in case of circumstantial evidence to be watchful and to ensure that conjectures and suspicions do not take place of legal proof.**
2. **"it is well-settled that those circumstances must be proved to be such as to be conclusive of the guilt of the accused and incapable of explanation on any hypothesis consistent with the innocence of the accused.**
3. **"Modern thinking is in favour of the view that proof beyond a reasonable doubt is the same as proof which affords moral certainty to the Judge."**

Highlights italicised

Relevant Extracts (Verbatim)

> The learned Senior Advocate, Mr. Jaspal Singh, has been able to state the proposition of law with due clarity. It has been contended that in the event of there being only circumstantial evidence, it is well-settled that those circumstances must be proved to be such as to be conclusive of the guilt of the accused and incapable of explanation on any hypothesis consistent with the innocence of the accused. It has been contended further that it is on this score the law seems to be well-settled as well, to writ that the Courts will be well-advised in case of circumstantial evidence to be watchful and to censure that conjectures and suspicions do not take place of legal proof. It has been the appellant's contention that the prosecution has utterly failed to link up the chain and as a matter of fact the snap in the chain is not very far to seek, thus warranting an order of acquittal and the High Court has fallen into a manifest error in regard thereto. The evidence of PW-1 and PW-23 being Madan Singh and Dinesh Chand was taken recourse to. It is on this score, it has been contended that (a) None of them has identified the appellant; (b) None of them has stated the it was the appellant who had checked in on 18-9-1991; (c) None of them has stated that it was the appellant who had checked out on 19-9-1991 at 8.30 a.m.; and (d) Rather both the witnesses have stated that appellant was not the person who had checked in on 18-9-1991 or who had checked-out in on 18-9-1991 at 8.30 a.m. and drawing inspiration therefrom, Mr. Singh in support of the appeal contended that there is thus no direct evidence available to prove that it was the appellant who had checked in on 18th September, 1991 or had left the hotel on 19th September, 1991. Admittedly, there is no difficulty in appreciating the submissions of Mr. Singh. Availability of direct evidence is not there but what about the circumstances? Before doing so, be it noted that the evidence of PW-6, Sahmim Bano as to the date of departure of the accused with his wife Hazra *alias* Halima from Bombay to Delhi and the subsequent telephonic message that Halima died in a bus accident and that cremation has taken place in Nizamuddin stand out to be a rather significant component of the chain of evidence.

17. *State of Madhya Pradesh v Sanjay Rai,* AIR 2004 SC 2174 : 2004 AIR SCW 1919 : 2004 Cr LJ 2006 (SC). May also see: *Golam Majibuddin v State of West Bengal*, 1972 Cr LJ 1342 (SC); *Mahmood v State of Uttar Pradesh*, AIR 1976 SC 69 : (1976) 1 SCC 542 : 1976 Cr LJ 10; *Sanwat Singh v State of Rajasthan*, AIR 1961 SC 715 : (1961) 3 SCR 126 : (1961) 1 Cr LJ 766.

(a) The appellant came to visit Delhi along with his wife Hazra *alias* Halima leaving Bombay on 17th September, 1991.

(b) On 18th September, 1991 at about 8.50 p.m. both of them claimed to be husband and wife. Alamgir, appellant entered his name and address in the guest register and received the key of Room No. 107 and stayed in Room No. 107 in Royal Inn Guest House, Netaji Subhash Marg, Daryaganj, Delhi.

(c) On 19th September, 1991 in the morning at 8.30 a.m., Alamgir left the guest house locking his wife in the room and did not return thereafter.

(d) The appellant telephonically informed PW-6, Shamim Bano that the deceased died in a bus accident and was buried in Nizamuddin and thereafter the appellant left Delhi for Bombay.

(e) The appellant's wife was found dead due to strangulation in Room No. 107 on opening of the same with a duplicate key on 20th September, 1991.

(f) The appellant was arrested at Bombay on 21st September, 1991 and key of the room was recovered from him along with ticket from Delhi to Bombay dated 19th September, 1991 proving that he after killing his wife instead of taking her care, had left for Bombay on 19th September, 1991. Only beyond the range of a reasonable doubt, of course, the expression 'reasonable doubt' is incapable of definition. Modern thinking is in favour of the view that proof beyond a reasonable doubt is the same as proof which affords moral certainty to the judge.

The question for consideration is thus as to whether the circumstances noticed above would form a complete chain of events without any snap and pointedly point to the accused as the guilty person and to no-one else. In the event there is an answer in the affirmative, question of interference with the order of the High Court would not arise. Incidentally, the High Court did emphasize on the true and correct meaning of the phraseology 'reasonable doubt' to be attributed thereon and it is on this score, the High Court records:

Modern thinking is in favour of the view that proof beyond a reasonable doubt is the same as proof which affords moral certainty to the Judge.

We are, however, not expressing any opinion with regard thereto. Suffice it to say that sufficiency of moral certainty itself is a matter for deliberation and since the matter has not been addressed to us on that score, expression of opinion on the same would not arise.

The circumstances noticed above, if read with the evidence of PW-6, Shamim Bano as to the date of departure of the accused with his wife Hazra *alias* Halima from Bombay to Delhi and the telephonic message after two days that Halima had died in a bus accident and that she had been cremated at a cremation ground in Nizamuddin – this piece of evidence, as noticed above, if read along with the circumstances noticed above, would form a chain without there being any snap. Strenuous submissions have been made as regards the admissibility of the Handwriting Expert's opinion as also a challenge thrown to the non-admissibility of the entire evidence of Shamim Bano, PW-6. This evidence of Shamim Bano has been challenged on two counts: on the first Shamim Bano, being the sister of Halima, was an interested witness and secondly, she did not say so in a statement before the police under section 161, Cr. P.C. Interested witness by itself cannot possibly be a ground to reject the evidence on record. The test of creditworthiness or acceptability, in our view, ought to be the guiding factor and if so, question of raising an eyebrow on the reliability of witness being an interested witness would be futile in the event of the evidence being otherwise acceptable, there ought not to be any hindrance in the matter of prosecutor's success. The evidence must inspire confidence and in the event of unshaken credibility, there is no justifiable reason to reject the same. It is on this score the issue of interested witness thus stands negated, as raised by the appellant. The second limb pertains to the statement under section 161, Cr. P.C. Admittedly, the piece of evidence was not available in the statement of the witness under section 161, Cr. P.C., but does it take away the nature and character of the evidence in the event there is some omission on the part of the police official. Would that be taken recourse to as amounting to a rejection of an

otherwise creditworthy and acceptable evidence—the answer, in our view, cannot but be in the negative. In that view of the matter, the evidence of PW-6 thus ought to be treated as creditworthy and acceptable and it is to be seen as the effect of such an acceptability.

Similar, however, is the opinion of this Court in *Pawan Kumar v State of Haryana*, (2001) 3 SCC 628 : AIR 2001 SC 1324 : 2001 AIR SCW 1111, in which one of us (U.C. Banerjee, J.) was a party. The opinion of the Court runs as under:

> Incidentally, success of the prosecution on the basis of circumstantial evidence will, however, depend on the availability of a complete chain of events so as not to leave any doubt for the conclusion that the act must have been done by the accused person. While, however, it is true that there should be no missing links, in the chain of events so far as the prosecution is concerned, but it is not that every one of the links must appear on the surface of the evidence, since some of these links may only be inferred from the proven facts. Circumstances of strong suspicion without, however, any conclusive evidence are not sufficient to justify the conviction and it is on this score that great care must be taken in evaluating the circumstantial evidence. In any event, on the availability of two inferences, the one in favour of the accused must be accepted and the law is well-settled on this score, as such we need not dilate much in that regard excepting, however, noting the observations of this Court in the case of *State of Uttar Pradesh v Ashok Kumar Srivastava*, AIR 1992 SC 840 : 1992 AIR SCW 640 : 1992 Cr LJ 1104, wherein this Court in paragraph 9 of the report observed:—
>
> *"This Court has, time out of number, observed that while appreciating circumstantial evidence the Court must adopt a very cautious approach and should record a conviction only if all the links in the chain are complete pointing to the guilt of the accused and every hypothesis of innocence is capable of being negatived on evidence. Great care must be taken in evaluating circumstantial evidence and if the evidence relied on is reasonably capable of two inferences, the one in favour of the accused must be accepted. The circumstance relied upon must be found to have been fully established and the cumulative effect of all the facts so established must be consistent only with the hypothesis of guilt. But this is not to say that the prosecution must meet any and every hypothesis put forward by the accused, however, far-fetched and fanciful it might be. Nor does it mean that prosecution evidence must be rejected on the slightest doubt because the law permits rejection if the doubt is reasonable and not otherwise."*
>
> The other aspect of the issue is that the evidence on record, ascribed to be circumstantial, ought to justify the inferences of the guilt from the incriminating facts and circumstances which are incompatible with the innocence of the accused or guilt of any other person. The observations of this Court in the case of *Balwinder Singh v State of Punjab*, AIR 1987 SC 350 : 1987 Cr LJ 330 : (1987) 1 SCC 1 lends concurrence to the above."

In a more recent decision of this Court in *Sudama Pandey v State of Bihar*, (2002) 1 SCC 679, the law as noticed above and to the same effect stands very felicitously expressed.

There is no doubt that conviction can be based solely on circumstantial evidence but it should be tested by the touch-stone of law relating to circumstantial evidence laid down by this Court as far back as in 1952.

In *Hanumant Govind Nargundkar v State of Madhya Pradesh*, AIR 1952 SC 343 : 1952 SCJ 509 : 1952 SCR 1091, it was observed thus:

> *It is well to remember that in cases where the evidence is of a circumstantial nature, the circumstances from which the conclusion of guilt is to be drawn should in the first instance be fully established and all the facts so established should be consistent only with the hypothesis of the guilt of the accused. Again, the circumstances should be of a conclusive nature and tendency and they should be such as to exclude every hypothesis but the one proposed to be proved. In other words, there must be a chain of evidence so far complete as not to leave any reasonable ground for a conclusion consistent with the innocence of the accused and it must be such as to show that within all human probability the act must have been done by the accused.*

A reference may be made to a later decision in *Sharad Birdhichand Sarda v State of Maharashtra*, AIR 1984 SC 1622 : (1984) 4 SCC 116 : 1984 Cr LJ 1738. Therein, while dealing with circumstantial evidence, it has been held that onus was on the prosecution to prove that the chain is complete and the infirmity of lacuna in prosecution cannot be cured by false defence or plea.

The conditions precedent in the words of this Court, before conviction could be based on circumstantial evidence, must be fully established. They are:

(1) the circumstances from which the conclusion of guilt is to be drawn should be fully established. The circumstances concerned 'must' or 'should' and not 'may be' established;

(2) the facts so established should be consistent only with the hypothesis of the guilt of the accused, that is to say, they should not be explainable on any other hypothesis except that the accused is guilty;

(3) the circumstances should be of a conclusive nature and tendency;

(4) they should exclude every possible hypothesis except the one to be proved; and

(5) there must be a chain of evidence so complete as not to leave any reasonable ground for the conclusion consistent with the innocence of the accused and must show that in all human probability the act must have been done by the accused.

These aspects were recently highlighted in *State of Rajasthan v Rajaram*, AIR 2003 SC 3601 : 2003 AIR SCW 4097 : 2003 Cr LJ 3901.

There is no doubt that conviction can be based solely on circumstantial evidence but it should be tested by the touchstone of law relating to circumstantial evidence laid down by this Court as far back as in 1952.

37.9 "RAREST OR RARE CASE"[18]

Author's Summary

It is a landmark judgment in which the Apex Court discussed the Case Law on the subject. It provides guidelines to identify the 'Rarest of the Rare Cases' and also discussed the situations how to differentiate them from the borderline murder cases.

In this case, a husband-wife pair killed close relatives for pelf. The Trial Court sentenced them to death. High Court changed the sentence to life imprisonment. SC found the case to be Rarest of the rare cases and sentenced them to death.

Highlights italicised

Relevant Extracts (verbatim)

Having held that both A-1 and A-2 are guilty of the murder of deceased Relu Ram and his family and that their conviction under section 302 read with section 34 and section 120B and other provisions inflicted upon them by both the courts below does not call for any interference by this Court,

> *we now proceed to decide whether the instant case is one of rarest of rare cases warranting death sentence, as has been held by the trial court to be one, or the one in which sentence of life imprisonment would be appropriate, as has been held by the High Court while commuting the sentence of death to life imprisonment.*

Learned counsel appearing on behalf of the accused submitted that the present case cannot be said to be rarest of the rare one so as to justify the imposition of extreme penalty of death.

18. *Ram Singh v Sonia*, AIR 2007 SC 1218 : 2007 AIR SCW 1278 : 2007 Cr LJ 1642.

This question has been examined by this Court times without number. In the case of *Bachan Singh v State of Punjab,* (1980) 2 SCC 684 : AIR 1980 SC 898 : 1980 Cr LJ 636 before a Constitution Bench of this Court validity of the provision for death penalty was challenged on the ground that the same was violative of articles 19 and 21 of the Constitution and while repelling the contention, the Court laid down the scope of exercise of power to award death sentence and the meaning of the expression "rarest of the rare" so as to justify extreme penalty of death and considered that clauses (1) and (2) of Article 6 of the International Covenant on Civil and Political Rights to which India has acceded in 1979 do not abolish or prohibit the imposition of death penalty in all circumstances. All that they required is that, *firstly*, death penalty shall not be arbitrarily inflicted; *secondly*, it shall be imposed only for most serious crimes in accordance with a law, which shall not be an *ex post facto* legislation. The Penal Code prescribes death penalty as an alternative punishment only for heinous crimes, which are not more than seven in number. Section 354(3) of the Criminal Procedure Code, 1973 in keeping with the spirit of the International Covenant, has further restricted the area of death penalty. Now according to this changed legislative policy, which is patent on the face of section 354(3), the normal punishment for murder and six other capital offences under the Penal Code, is imprisonment for life (or imprisonment for a term of years) and death penalty is an exception. The present legislative policy discernible from section 235(2) read with section 354(3) is that in fixing the degree of punishment or making the choice of sentence for various offences, including one under section 302, Penal Code, the Court should not confine its consideration "principally" or merely to the circumstances connected with the particular crime, but also give due consideration to the circumstances of the criminal. In many cases, the extremely cruel or beastly manner of the commission of murder is itself a demonstrated index of the depraved character of the perpetrator. And it is only when the culpability assumes the proportion of extreme depravity that "special reasons" can legitimately be said to exist. Judges should never be bloodthirsty. It is, therefore, imperative to voice the concern that courts, aided by the broad illustrative guidelines indicated, will discharge the onerous function with evermore scrupulous care and humane concern, directed along the highroad of legislative policy outlined in section 354(3), *viz.*, that for persons convicted of murder, life imprisonment is the rule and death sentence an exception.

In the case of *Machhi Singh v State of Punjab,* AIR 1983 SC 957 : 1983 Cr LJ 1457 : (1983) 3 SCC 470, a 3-Judge Bench of this Court following the decision in *Bachan Singh* (supra), observed

> *that in rarest of rare cases when collective conscience of the community is so shocked that it will expect the holders of the judicial power centre to inflict death penalty irrespective of their personal opinion as regards desirability or otherwise of retaining death penalty. The community may entertain such a sentiment in the following circumstances:*
>
> *I.* ***When the murder is committed in an extremely brutal, grotesque, diabolical, revolting or dastardly manner so as to arouse intense and extreme indignation of the community. For instance,***
>
> *(i) when the house of the victim is set aflame with the end in view to roast him alive in the house;*
>
> *(ii) when the victim is subjected to inhuman acts of torture or cruelty in order to bring about his or her death; and*
>
> *(iii) when the body of the victim is cut into pieces or his body is dismembered in a fiendish manner.*
>
> *II.* ***When the murder is committed for a motive which, evinces total depravity and meanness. For instance when***
>
> *(a) hired assassin commits murder for the sake of money or reward; or*
>
> *(b) a cold-blooded murder is committed with a deliberate design in order to inherit property or to gain control over property of a ward or a person under the control of the murderer or vis-a-vis whom the murdered is in a dominating position or in a position of trust; or*
>
> *(c) a murder is committed in the course for betrayal of the motherland.*

III.

(a) When the murder of a member of a Scheduled Caste or minority community etc., is committed not for personal reasons but in circumstances etc., which arouse social wrath. For instance when such a crime is committed in order to terrorise such persons and frighten them into fleeing from a place or in order to deprive them of, or make them surrender, lands or benefits conferred on them with a view to reverse past injustices and in order to restore the social balance.

(b) In cases of 'bride burning" and what are known as 'dowry deaths' or when murder is committed in order to remarry for the sake of extracting dowry once again or to marry another woman on account of infatuation.

IV. When the crime is enormous in proportion. For instance, when multiple murders say of all or almost all the members of a family or a large number of persons of a particular caste, community, or locality, are committed.

V. When the victim of murder is

(a) an innocent child who could not have or has not provided even an excuse, much less a provocation, for murder;

(b) a helpless woman or a person rendered helpless by old age or infirmity;

(c) when the victim is a person vis-a-vis whom the murderer is in a position of domination or trust;

(d) when the victim is a public figure generally loved and respected by the community for the services rendered by him and the murder is committed for political or similar reasons other than personal reasons.

In the said case, the Court further observed that in this background the guidelines indicated in the case of *Bachan Singh* (supra) will have to be culled out and applied to the facts of each individual case and where the question of imposing death sentence arises, the following proposition emerge from the case of *Bachan Singh* (supra):—

(i) The extreme penalty of death need not be inflicted except in gravest cases of extreme culpability.

(ii) Before opting for the death penalty the circumstances of the 'offender' also require to be taken into consideration along with the circumstances of the 'crime'.

(iii) Life imprisonment is the rule and death sentence is an exception. In other words death sentence must be imposed only when life imprisonment appears to be an altogether inadequate punishment having regard to the relevant circumstances of the crime, and provided, and only provided, the option to impose sentence of imprisonment for life cannot be conscientiously exercised having regard to the nature and circumstances of the crime and all the relevant circumstances.

(iv) A balance-sheet of aggravating and mitigating circumstances has to be drawn up and in doing so the mitigating circumstances have to be accorded full weightage and a just balance has to be struck between the aggravating and the mitigating circumstances before the option is exercised.

The Court thereafter observed that in order to apply these guidelines the following questions may be answered:—

(a) Is there something uncommon about the crime, which renders sentence of imprisonment for life inadequate and calls for a death sentence?

(b) Are the circumstances of the crime such that there is no alternative but to impose death sentence even after according maximum weightage to the mitigating circumstances which speak in favour of the offender?

Ultimately, in the said case of *Machhi Singh* (supra), the Court observed that if upon an overall global view of all the circumstances in the light of the aforesaid proposition and taking into account the answers to the questions posed hereinabove, the circumstances of the case are such that death sentence is warranted, the Court would proceed to do so.

In the light of the law already laid down by this Court referred to above, now this Court is called upon to consider whether the present case would come within the realm of the rarest of the rare or not.

The instant case is one wherein accused Sonia, along with accused Sanjiv [her husband] has not only put an end to the lives of her step-brother and his whole family, which included three tiny tots of 45 days, 2-1/2 years and 4 years, but also her own father, mother and sister in a very diabolic manner so as to deprive her father from giving the property to her step-brother and his family. The fact that murders in question were committed in such a diabolic manner while the victims were sleeping, without any provocation whatsoever from the victims' side indicates the cold-blooded and premeditated approach of the accused to cause the death of the victims. The brutality of the act is amplified by the grotesque and revolting manner in which the helpless victims have been murdered which is indicative of the fact that the act was diabolic of most superlative degree in conception and cruel in execution and that both the accused persons are not possessed of the basic humanness and completely lack the psyche or mind set which can be amenable for any reformation. If this act is not revolting or dastardly, it is beyond comprehension as to what other act can be so.

In view of these facts we are of the view that there would be a failure of justice in case death sentence is not awarded in the present case as the same undoubtedly falls within the category of rarest of rare cases and the High Court was not justified in commuting death sentence into life imprisonment. In the result Criminal Appeal No. 142 of 2006 filed by the accused persons is dismissed whereas Criminal Appeal No. 895 of 2005 filed by private prosecutor and Criminal Appeal No. 894 of 2005 filed by the State of Haryana are allowed, order passed by the High Court commuting death sentence into life imprisonment is set aside and order of the trial court awarding death sentence is restored.

37.10 FINGERPRINTS: IDENTIFICATION BASIS[19]

Author's Summary

This is an important case. It discusses the number of matching points to declare identification of a fingerprint. Various counties/bureaus use different numbers, usually from 6 to 16.The court has accepted that**: *'if there are five or six 'well-grouped' characteristics and the patterns uncommon, the identification is definite'. The consensus of modern opinion is that six, four in sequence, are sufficient to justify a definite opinion being given."***

Highlights italicised

Relevant Extracts (verbatim)

Interest in modern fingerprints identification dates from 1880. With the publication of articles of Henry-Faulds and W.J. Herschel, who was in Indian Civil Service, about uniqueness and permanence of fingerprints, facts which the English Scientist Sir R. Galton was to verify through lengthy systematic observations. Systems of fingerprint classification were developed later by Sir E.R. Henry, formerly of Indian Civil Service and afterwards Chief Commissioner of the London Metropolitan Police and by Juan Vucetich of Argentina. However, Henry system of classification has been adopted by scores of law enforcement agencies around the world and is the most widely used method of fingerprint classification. All impressions are broadly classified as arches, loops, whorls and composites or compounds and there are further sub-divisions. In arches the ridges run from one side to the other without making a backward turn, unlike to loops, whorls or composites. In loop, whorl or composites types there are fixed points, which are known as delta or

19. *State of Madhya Pradesh v Sitaram Rajput*, 1978 Cr LJ 1220 : 1978 MPLJ 197.

outer terminus and the core or the inner terminus. These serve a useful purpose in the classification of fingerprints. Generally there are no deltas or cores in arches. There are also considerable amount of finger details of branching and coalescence of ridges, of island and unlimited quantity of extremely fine pore details along individual ridges. About 5 per cent of the impressions are arches, 60 per cent loops and 35 per cent whorls and composites. Loops and whorls always predominate.

For the purpose of comparison of two fingerprints, *i.e.,* the disputed and the specimen, to begin with the patterns are seen. If the patterns are different then the impressions are of different persons. If the patterns are similar then it is seen whether general flow of the ridges is similar. Then the ridge characteristics of the two impressions are compared. Two common fixed points are then located. In cases of loops, whorls or composites, core is taken as the inner terminus and the delta outer terminus. Generally speaking, core and delta are not available in cases of arches. So also in partial or blurred impressions such core and delta may not be available. So dot, rod, ridge end, bifurcation, island etc., are taken as the starting point. Similarly outer point is fixed. Having got or fixed the two points, their similarity is determined by counting the number of ridges in between the two points. If the numbers tally, then the sequence of individual ridge characteristics and their relative positions are observed. The points of similarities are then noted. If the relation of each of the points so noted in both the impressions is the same it is an absolute certainty that the impressions are of the same person.

Now question remains as to how many points of similarities can definitely establish the identity beyond question. The Federal Bureau of Investigation of USA requires twelve and the Scotland yards requires sixteen points of similarities for positive identification. However, some English and American authorities are of the view that if there are five or six 'well-grouped' characteristics and the patterns uncommon, the identification is definite. By well-grouped characteristics, they mean dots, islands, books and spurs. If five or six characteristics occur close to one another and in a narrow area, the force of identity is enhanced. In the case of blurred or partial impressions, the view of some of the Indian authors is that if there are three identical points, they would be sufficient to prove the identity. This has been questioned by other Indian authors who insist on at least six points of similarities to establish the identity. The Finger Prints Bureau of different States in India have fixed varying standards, requiring six to twelve points of similarities to determine the identity. In para 88 of the Finger Print Manual of M.P. State it has been observed: "If a sufficient number of ridge characteristics are in complete agreement in the two impressions it can be said definitely that the impressions were made by the same person. However, no definite rule can be laid down for fixing the number of the points of similarities. Four or five might be sufficient if there were unusual peculiarities. The consensus of modern opinion is that six, four in sequence, are sufficient to justify a definite opinion being given." It is said that the number is now changed to eight in Madhya Pradesh in view of certain decision of this court. The following extracts from the book Modern Criminal Investigation by Soderman and O'Connell may be quoted here in this regard:—

> *"The demand for twelve similar details is the result of the opinion of bygone days, founded on the opinion of Galton, Remus, Balthazard and others. All recent scientists working in the field of dactyloscopy, as for instance, Locard, De Rechter and others, share the opinion that the number of characteristic points which can be noted at the edge of an enlargement is a matter of little importance. A rare detail is an identification sign one hundred times more important than a whole series of forks, four to five details in a centre of an unusual pattern have much more value as evidence than twelve to fifteen forks in the periphery. Some ridges with unusually grouped pores have more weight than the classical twelve points".*

The branch of fingerprint is now a highly developed and technical subject. The classification of fingerprints is a science requiring much study and specialisation in the subject. Therefore, a fingerprint expert is in a more advantageous position to compare fingerprints and point out similarities or dissimilarities between two impressions by critical examination of the impressions. This was recognised by amendment of section 45 of the Evidence Act in 1899, making opinion of fingerprint expert relevant as was

the case with medical and hand-writing experts. Section 73 of the Act was also suitably amended, enabling taking of specimen thumb impressions for comparison. Section 510 of the Code of Criminal Procedure was amended in 1955 to make the report of the Director of Finger Print Bureau admissible under that section. The Supreme Court in *Phool Kumar v Delhi Administration,* AIR 1975 SC 905 : 1975 Cr LJ 778 : (1975) 1 SCC 797 has held that when neither the court nor the prosecution or the accused filed any application to summon and examine the fingerprint expert as to the subject-matter of his report, no objection can be taken at the appellate stage by the accused against his non-examination.

Majority of the High Courts have found that it cannot be laid down as a rule of law that it is unsafe to have conviction on the uncorroborated testimony of a fingerprint expert. The true rule seems to be one of caution. The court cannot delegate its authority to the expert but has to satisfy itself as to the value to be given to the evidence of the expert in the same way as to the value given to any other evidence. The reasons given by the expert in arriving at the conclusion are ultimately to be weighed by the court and satisfy itself about the correctness of the conclusion by comparison of the prints. The task of the court becomes much easier when the fingerprint expert has taken enlarged photo prints of the disputed and specimen fingerprints and marked the distinct points of similarities. Otherwise it becomes an uphill task to examine each and every individual prints with magnifying glass when there are large number of prints. If the enlarged photo prints are kept side by side and their marking compared, it becomes much easier to follow the reasonings of the fingerprint expert about points of similarities or dissimilarities and judge the correctness of his conclusion. In *Emperor v Sahdeo,* (1907) 3 Nag LR 1 : 5 Cr LJ 220 it has been observed:

> *"The papillary ridges covering the bulbous points of the human finger and thumb with which finger impressions are produced afford a surer criterion of identity than any other comparable body feature.*
>
> ***Where it is proved by competent expert testimony that two such impressions, made at different times, however far apart, contain several points of agreement and no points of disagreement in their minutial, no further evidence is necessary to prove that they were made by the same finger."***

There are no eyewitnesses in the case and obviously there could be none when the disbursing officer, officer certifying the works, muster-roll clerks and mates who had put their thumb-impression the muster-rolls against the fictitious names of various labourers are all accused persons. As the names of the labourers mentioned in the muster-rolls are all fictitious and to avoid detection the names of their villages were not mentioned and so there was no question of examining any of the labourers to show that they were never paid the wages as shown in the muster-roll. The prosecution case can only succeed if the prosecution is able to prove beyond doubt that the thumb impressions on the muster-rolls are all forged and they are, in fact, the thumb-impressions of the various respondents. The prosecution case, therefore, hinges on the evidence of fingerprint experts. We have the report, Ex. P. 143, of the Director of Finger Print Bureau which is admissible in evidence under section 510 of the Code although he has not been examined as a witness. We have also the report, Ex. P. 142 of Shri Vinayak (P.W. 53) who has been examined in court. The learned judge found the evidence of the fingerprint expert to be not satisfactory and he has given cogent reasons for arriving at this conclusion. It cannot be said that the reasoning of the learned judge is either perverse or unreasonable. In an appeal against acquittal it is not open to interfere even if another view of the evidence is reasonably possible, but here we are satisfied that the reasonings are well merited and there is nothing to differ from the view taken. There were in all about 320 disputed thumb-impressions which were alleged to be those of respondents Harisingh, Dalu, Khumansingh, Makhansingh and Maharajsingh and were referred to the fingerprint experts. The experts found that out of these 320 impressions some are smudged and are not fit for comparison, still the experts were left with quite a large number of legible fingerprints and it was not at all difficult to conclusively prove that the disputed fingerprints tally with the fingerprints of the aforesaid respondents. The fingerprint expert Vinayak,

(P.W. 53) had taken photo enlargement of only 12 disputed prints. He has also given his reasonings only in respect of these 12 prints though he stated that he had examined the other legible disputed prints with the specimen and he found them to be similar by examining the other prints which were not enlarged by magnifying glass. It may be mentioned that the reports Ex. P. 142 of Shri Vinayak and Ex. P. 143 of the Director do not tally in all respects. In Ex. P. 142 of Shri Vinayak questioned prints 442, 446, 465, 468A, 468C and 468D are shown as identical but the Director has stated in the report that these prints are unfit for comparison. Questioned prints 550, 554, and 554A have been stated by the expert to be identical but there is no such report about them by Director. Similar is the case with regard to prints 606 and 606A. If there are points of similarities between disputed and specimen prints there is no reason why the expert should differ.

Shri Vinayak admits that the best course to follow is to prepare enlarged photographs of the disputed and specimen prints to the same scale. Then, on the photographs a line may be drawn to connect the centre and the junction points. The lines between the two points should now be carefully counted. The next step is to find out how many agreements in detail there are on either side of the drawn line, such as free ends, forks, ellipses, tongues and rods and to see how they are situated as regards their relative positions with one another. One should also verify that the general pattern is the same in both, but he clearly admits that he did not consider the pattern of the prints. He has failed to take enlarged photographs of all the disputed prints which were subject to examination and comparison by him. He has not marked two fixed points nor drawn a line between the two points, nor he has counted the number of ridges in between. Although he admits that most of the disputed fingerprints were quite legible, still he has only marked out six points of similarities in each of 12 enlargements of the disputed fingerprints. His opinion is mainly based on the ridge characteristics which agree in nature and relative position. Perhaps, he has followed the instructions in the Finger Print Manual of M.P. State but in the Manual it is mentioned that 4 or 5 points of similarities might be sufficient if there are unusual peculiarities. Though normally six points of similarities, four in sequence, are sufficient to justify a definite opinion being given. It is not the opinion of Shri Vinayak that any of these prints had unusual peculiarities nor he has stated that at least four points of similarities were in sequence. This apart he has contradicted his report in the cross-examination in respect of several items. About photo enlargement, Ex. P. 126, he has mentioned that to the east of point No. 3 there is west-ward bifurcation with no ridge intervening but in cross-examination he admitted that point No. 4 is an end of a ridge. Similarly with regard to photo enlargement, Ex. P. 128 he has mentioned that point No. 1 is end of a ridge and to the east of point No. 3 and after the intervention of 3 ridges there is end of a ridge but in cross-examination he admitted that point No. 1 is an upward bifurcation and is not end of a ridge and point No. 4 is also bifurcation and is not end of a ridge. Under the circumstances the prosecution has failed to prove beyond doubt that the thumb-impressions on the muster-rolls are forged. The prosecution has also failed to show that no work, in fact, has been executed in respect of which these payments were made as per these 13 muster-rolls. We, therefore, find no reason to interfere with the acquittal.

37.11 ADMISSIBILITY OF FOOTWEAR MARKS[20]

Author's Summary

Track marks evidence is generally dubbed as rudimentary science. However in this case the trial court, the high court and the Supreme court accepted the track evidence to identify the culprits evidence:

Highlights italicised

20. *Pritam Singh v state of Punjab,* AIR 1956 SC 415 : 1956 Cr LJ 805 (SC).

Relevant Extracts (verbatim)

We are unable to accept this contention. The science of identification of footprints is no doubt a rudimentary science and not much reliance can be placed on the result of such identification. The track evidence, however, can be relied upon as a circumstance which, along with other circumstances, would point to the identity of the culprit though by itself it would not be enough to carry conviction in the minds of the court.

The shoes had been recovered in the search of the house of the accused and the result of the search was proved by calling the search witnesses whose evidence was believed by both the courts with the result that these shoes, having been recovered from his house, the ownership of the shoes was *prima facie* established to be his even though the accused had alleged that he has not been staying in the house but had rented the house for some acquaintance of his.

There was evidence to show that he and his wife were staying there right up to 10 A.M. on June 9, 1953 on which day the search was made and if this evidence was believed it would go to establish his ownership of the shoes. If he was the owner of these shoes it was quite legitimate to compare the impressions made by these shoes with the mould prepared from the footprints on the spot.

The learned additional sessions judge, however, in order to derive further assurance attempted, in the examination of the accused under section 342, Code of Criminal Procedure to see if these shoes which had been recovered from the house of the accused fitted his feet. If the accused has refused to accede to this suggestion of the learned additional sessions judge he would have been justified in doing so and there is no provision in law by which this demonstration could have been made.

The accused, however, agreed to do so and on the shoes being tried on his feet. It appeared that they fitted his feet. Realising, however, that the result of this demonstration would be adverse to his defence he complained that the shoes were too tight for his feet.

The learned additional sessions judge, however, thought otherwise and recorded his impressions accordingly. This type of evidence was very strongly criticised by the learned counsel for the appellant as real evidence which was not justified at all by the provisions of section 539B, Code of Criminal Procedure or otherwise and it was urged that it was a matter which prejudiced the defence of the accused.

The learned additional sessions judge was certainly not entitled to allow his view or observations to take the place of evidence because such view or observation of his could not be tested by cross-examination and the accused would certainly not be in a position to furnish any explanation in regard to the same.

The whole thing appears to have been done with the consent of the accused and the only criticism which could be legitimately levelled was against the observation recorded by the learned additional sessions judge that:

> *to all appearances they quite fitted the feet of the accused even though he complained that the shoes were too tight for his feet.*

This observation could not carry the matter any further for the prosecution and the only fact which could be relied upon by the prosecution was that the shoes apparently fitted the feet of the accused and the learned additional sessions judge and the assessors were entitled only to take into account the fact that the shoes apparently fitted the feet of the accused though he complained that they were too tight for his feet.

This was an ocular demonstration and the result of such ocular demonstration could certainly be taken into account by the learned additional sessions judge and the assessors and they were entitled to come to their own conclusions taking into account the further fact that the accused did complain at the time that the shoes were too tight for his feet.

The evidence of the trackers and also the fact that shoes were found in the house of the accused and the impressions made thereby tallied with the moulds prepared from the footprints on the spot were even otherwise enough to establish the identity of the footprints and point to Pritam Singh Fatehpuri as one of the culprits.

The case of Pritam Singh Lohara in regard to the track evidence was no different. In spite of the fact that none of the witnesses of the occurrence nor Pritam Singh, the driver, had stated anywhere before that Pritam Singh Lohara had a limp in his gait, the result of the evidence of the trackers was sufficient to establish that one of the culprits made footprints which showed that his way of walking was outwards and he put his right foot more outwards than the left.

This was quite characteristic of Pritam Singh Lohara by reason of the limp in his gait and this was further demonstrated by the impressions which he made when he walked in the district jail with the shoes given to him there on the sandy patch which was specially prepared for the purpose.

This evidence in regard to Pritam Singh Lohara also was believed by both the courts below as sufficient to establish his identity as one of the culprits and we are not prepared to differ from their appreciation of the evidence. The track evidence, therefore, was a circumstance which was available to the prosecution against Pritam Singh Fatehpuri and Pritam Singh Lohara.

37.12 NAKED FOOTPRINT MARKS[21]

Author's Summary

It is a case in which naked footmarks were compare by the High Court judge himself and the evidence on the marks was discussed threadbare. The court ultimately came to the conclusion:

'*The comparison has thus stood the test well and, under the circumstances these foot impressions in blood near the place of the incident which are proved to be those of the accused-appellant Surajpal Singh by preponderance of probabilities are a strong incriminating circumstance against the accused-appellant Surajpal Singh for which he has not accounted'.*

Highlights italicised

We examined and compared the footprints for ourselves and in our opinion, there is such a remarkable similarity between the admitted footprints of the accused-appellant, Surajpal Singh, and the footprints in blood found on the spot that there is a high degree of probability that the footprints in blood found on the floor of the verandah of the accused-appellant, Surajpal Singh, are the footprints of the accused-appellant.

In *Pritam Singh v State of Punjab,*[1] Bhagwati J, speaking for the court said:

> *The science of identification of footprints is no doubt a rudimentary science and not much reliance can be placed on the result of such identification. The track evidence, however, can be relied upon as a circumstance which, along with other circumstances, would point to the identity of the culprit, though by itself it would not be enough to carry conviction in the minds of the court.*

It was, however, unfortunate that it was not brought to the notice of the court that the identification of persons from footprints has many facets and all these facets could not be clubbed together, and science of identification from footprints be dubbed as a rudimentary science.

The identification of persons from footprints may broadly be classified as under:

1. Identification from footprints when the footprints show ridge characteristics. In such cases, the science is as accurate as the science of fingerprints. The prints of the foot of a person show ridge characteristics of his fingers and may be used in a similar way for the identification of persons from similarity of ridge characteristics.

21. *Surajpal Singh v State of Madhya Pradesh*, 1972 Cr LJ 1668 : 1972 MPWR 394 : 1972 MPLJ 1029.

2. Identification from footprints which have special characteristics apart from ridge, etc. Some feet have special characteristics such as a scar at a particular place, an extra or missing toe, a deformative peculiarity. In this case, the value of identification is proportional to the number of peculiarities.

3. Identification of footprints, which show neither ridge characteristics nor other special peculiarities. This is what we usually understand by identification from footprints though quite erroneously because it is only one of the three categories of identification from footprints. This is based on what is known as "Gayer System" as propounded by GW Gayer, I.P., in his book.[22] In this system which is based on the system of the "Khojis", who were professional trackers of Rajputana, a foot has 12 features namely the five toes called Anguta, Dusri, Tesri, Chouthi and Chichi, the head line of the ball of the foot called Zanjiri, the ball of the foot called Pab, the instep called Talli, the length of the foot from uppermost point of Anguta to the lower most of the heel (Eri) called Chab, the heel called, Eri, the inner margin of the foot called, Bari Assi and the outer margin of the foot called Choti Assi. According to the author, every one of the twelve features has as much characters as the features of a face. Once a pupil learns to distinguish them at a glance, he can recognise a person from his foot impressions as easily as he can from his face. These features and their characteristics are compared with reference to three guidelines; the first is a vertical line going from the highest point of the big toe (Anguta) to the centre of the heel (Eri), the second line is at right angle to the aforesaid line running under the base of the little toe (Chichi) and the third joins the highest point of the big toe to the top of the little toe and joins the second line. The author further says at page 3:

> *It is obvious that every individual's footprint must have a distinct individuality for even if there were only three common types of each of the features; and we had nothing else to go on, the total possible number of different types would be 531441, so that, on the average, two feet in about every million would be similar. A careful study of the illustrations and of the text will show that these figures do not err on the side of exaggeration.*

Again at page 6, paragraph 30, the author to avoid possibilities of error in identification says:

> *When two impressions are being compared with each other with the object of finding out if both have been made by the same foot one thing must be clearly understood, if they are impressions of the same foot they will agree in all essential points and there will be no points of disagreement. If there are points of disagreement and these have not obviously been caused by some peculiarity or irregularity of the ground, or by some accident, it should be at once admitted that the impressions are those of different feet.*

Rejecting the contention that the study of footprints is not a science in *Din Muhammad v Emperor*[23] , the court of the Judicial Commissioner at Nagpur (H.J. Stanyon and H.F. Hallifax, A.J. Cs.) as far back as in 1914 held:

> *Now the knowledge of handwriting and that of finger impressions have been systematised and arranged under general truth and principles by many writers and pursued by many enquiries, and they are both sciences in which a great deal of progress has been made. The knowledge of footprints has similarly been systematised and pursued by trackers, mainly uncivilised and ignorant people in all other respects, all over the world, and also at the Saugar Police Training School under Mr. G.W. Gayer, who has arranged the knowledge he obtained from other seekers and from his own observations and experiments in a valuable monograph entitled 'Footprints'. The matter is, therefore, undoubtedly a science and the opinion of a person specially skilled in it is a relevant fact, under section 45 of the Evidence Act.*

22. GW Gayer, *Foot Prints: An Aid to the Detection of Crime for the Police and Magistracy*, 1st Edn, 1909.
23. *Din Muhammad v Emperor,* Central Provinces Police Gazette, decided on 27 May 1914, pp 125-130.

In the instant case the points of similarities are 9 in respect of the right foot impressions, 10 in respect of the left foot impressions and the points of dissimilarities are three only in each case which have been explained by the expert (P.W. 13) is due to the different densities of the media in which the foot impressions were made namely, printer's ink and blood. The comparison has thus stood the test well and, under the circumstances these foot impressions in blood near the place of the incident which are proved to be those of the accused-appellant Surajpal Singh by preponderance of probabilities are a strong incriminating circumstance against the accused-appellant Surajpal Singh for which he has not accounted.

37.13 CONVICTION ON FIREARM EVIDENCE ALONE[24]

Author's Summary

It is a landmark judgment on Forensic Ballistics. In this case of murder, the SC ruled that conviction of a murderer can be based upon ballistics expert's opinion alone. They have cited numerous authorities to support the view**. SC Verdict:**

'*If there is no reason to think that there is any room for error in matters of this kind and it is safe to accept the opinion of the expert, then clearly it is established that the cartridge Ex. 1, found near the cot of Daya Ram, was fired from the pistol Ex. III produced by the appellant'***.**

Highlights italicised

Relevant Extracts (Verbatim)

While the sessions judge believed the testimony of the eyewitnesses, the learned judges of the High Court were of the opinion that they were unable to accept the assertion of the eye-witnesses that they actually saw the appellant with a pistol by the bed-side of the deceased. The High Court, however, relied upon the circumstantial evidence in the case in upholding the conviction of the appellant. There was motive for the crime and a few days before the killing of Daya Ram, the appellant had held out a threat against him. The appellant was arrested fourteen miles away from his village which is the place of occurrence. He produced a pistol (Ex. III) from his house in circumstances which clearly showed that he only could have known of its existence there. The opinion of the firearms expert clearly established that the cartridge (Ex. I), found near the cot of Daya Ram, was fired with the pistol (Ex. III) produced by the appellant. All these circumstances, in the opinion of the High Court left no doubt that the appellant murdered Daya Ram by shooting him with his pistol.

It was next urged on behalf of the appellant, that it was impossible for a cartridge to have been near the cot of Daya Ram, because after the shot had been fired the cartridge would still remain in the barrel of the firearm. This again is pure speculation. That the cartridge was ejected from the firearm is certain. Why it was ejected, none can say. It may be that the miscreant reloaded his weapon to meet any emergency. The evidence of the sub-inspector is clear that on his arrival at the place of occurrence the cartridge Ex. 1 was handed over to him by the witness Khamani who cannot be said to be unfavourable to the appellant. The courts below had no reason to disbelieve the evidence in the case that the cartridge Ex. 1 was found near the cot of Daya Ram and we can find no extraordinary circumstance to justify as saying that the courts below took an erroneous view of the evidence.

The real question is, whether it is safe to act upon the opinion of the firearms expert that the cartridge Ex. 1 was fired from the pistol Ex. III produced by the appellant and none other, because without that evidence the circumstantial evidence in the case would be insufficient to convict the appellant of the crime of murder. The opinion of the firearms expert, based on the result of his tests, does not seem to have been

24. *Kalua v State of Uttar Pradesh*, AIR 1958 SC 180 : 1957 SCR 187 : 1958 Cr LJ 300 (SC).
Also see *Meera Puri v State of Nagaland*, 1971 Cr LJ 539 : 1971 Assam LR 22 (Ass and Nag).

challenged in cross-examination or before the High Court. If there is no reason to think that there is any room for error in matters of this kind and it is safe to accept the opinion of the expert, then clearly it is established that the cartridge Ex. 1, found near the cot of Daya Ram, was fired from the pistol Ex. III produced by the appellant.

To satisfy ourselves we have looked into the works of some authors dealing with the marks left on cartridge and shell cases by firearms in order to ascertain that there is no error in the opinion of the firearms expert in the present case. Kirk in his book *Crime Investigation* at page 346 states:

> ***"Fired cases are less often encountered in the criminal investigation than are bullets, but when found they are usually of greater significance because they receive at least as clear markings as do bullets, have a greater variety of such markings, and are not ordinarily damaged in firing…***
>
> ***The questions which may be asked as a result of finding such materials are similar to those that require answers when only bullets are located. In the ordinary case, quite definite answers can be given. This is true both of shotgun shells and of cartridge cases from pistols, revolvers, and rifles....In general, it is possible to identify a certain firearm as having fired a particular shell or cartridge, it is often possible to identify the type of make of gun which fired it, though in many instances this must be tentative or probable identification only".***

After dealing with the marks left by breech-block, firing pin impressions, marks from extractors and ejectors, marks due to expansion, magazine marks and loading mechanism marks, he states:

> ***"Summarising, the cartridge or shell case usually carries markings which are quite distinctive of the gun in which the charge is fired, and can be used for positive identification of the latter. These marks arise from a variety of contacts with various parts of the gun, an analysis of which is useful in determining the type of weapon in case no suspected gun is available... Thus, the recovered shell or cartridge case is one of the most useful types of physical evidence which can be found in shooting cases."***

Soderman and O'Connell in their book *Modern Criminal Investigation* also deal with the subject and they refer to the marks from the firing pin, the extractor, the ejector, and the breech block. After referring to the comparison being made of the cartridge or shell fired from a firearm for the purpose of test, they state at page 200:

> *"If they are in the same position in relation to one another and their general appearance is the same, one may conclude that they have been fired from a pistol of the same make. An absolute conclusion about the origin of the shells, however, can be reached only after a photomicrographic examination of the markings from the breech block on the rear of the shell..."*
>
> *Identification, with the aid of the enlargement, should not prove difficult. The characteristic scratch can be easily seen. A photograph of the incriminating shell and one of a comparison shell should be pasted side by side on cardboard, and the characteristic marks should be recorded with lines and ciphers, following the same method as that used in the identification of fingerprints".*

In Taylor's book on *Medical Jurisprudence*, 10th Edn., Vol. 1, at p. 459, it is stated:

> *"It is never safe to say that a cartridge case was not fired from a given pistol unless the marks are quite different, and a case which bears no marks at all may quite well have been fired from the same pistol as one which leaves well-defined marks. In general, however, though it is unlikely that all marks will be equally good, it is usually possible to obtain definite information from the marks of the firing pin, extractor, ejector or breech-block on the base or rim or from grooves or scratches on the surface. In weapons of the same manufacture the marks are of the same general nature, but in each weapon there are individual differences which usually enable it to be definitely identified".*

The expert's evidence, in this case, shows that he had fired test cartridges from the pistol Ex. III. He found the individual characteristics of the chamber to have been impressed

upon the test cartridge Exs. 9 and 10 and that exactly identical markings were present on the paper tube of the cartridge Ex. 1. He made photomicrographs of some of these individual marks on Exs. 1 and 10. In giving his reasons for his opinion, the firearms expert stated that every firearm has individual characteristics on its breech face, striking pin and chamber. When a cartridge is fired, gases are generated by the combustion of the powder, creating a pressure of 2 to 20 tons per square inch. Under the effect of this pressure the cap and the paper tube of the cartridge cling firmly with the breech face, striking pin and chamber and being of a softer matter the individualities of these parts are impressed upon them. By firing a number of test cartridge from a given firearm and comparing them under a microscope with the evidence cartridge, it can definitely be stated, if the marks are clear, whether the evidence cartridges had been fired or not from that firearm. It seems to us that the firearm expert made the necessary tests and was careful in what he did. There is no good reason for distrusting his opinion. The learned judges of the High Court examined the photomicrographs in question and were satisfied that there was no ground for distrusting the evidence of the expert. They were accordingly justified in coming to the conclusion that the cartridge Ex. 1, found near the cot of Daya Ram, was fired from the pistol Ex. III produced by the appellant from his house. There can, therefore, be no room for thinking, in the circumstances established in this case, that anyone else other than the appellant might have shot Daya Ram. He was, therefore, rightly convicted for the offence of murder.

The appeal is accordingly dismissed.

37.14 PELLETS IDENTIFICATION[25]

Author's Summary

It is a landmark SC judgment which appraised the linkage of buckshot with the shotgun in a case of murder and found it creditworthy. It had not been done before. It has important ramifications, the most important being that the smooth bore firearm (including improvised firearms) can be linked to the fired ammunition through them.

Further the court ruled that photographs are not necessary.

Highlights italicised

Relevant Extracts (Verbatim)

Judgment with Criminal Appeal Nos. 98-102 of 1999 and Criminal Appeal Nos. 109-114 of 1999 are filed by the State of Madhya Pradesh through CBI and the Criminal Appeal Nos. 103-108 of 1999 are filed by the Chhattisgarh Mukti Morcha. All these appeals arise out of the common judgment passed by the High Court of Madhya Pradesh on 26-6-1998. Nine accused persons were tried by the Second Addl. Sessions Judge, Durg, M.P. Accused Nos. 1 to 8 were charged for the offence under section 302 read with section 120B IPC. The 9th accused was charged under section 302 read with section 120B, and in the alternative, section 302 read with section 34 IPC and section 25(1)(A) and section 27 of the Arms Act. The Sessions Judge acquitted A-6 Naveen Shah, A-7 Chandrabaksh Singh and A-8 Baldev Singh Sandhu. A-1 Chandrakant Shah, A-2 Gyan Prakash Mishra, A-3 Avdhesh Rai, A-4 Abhay Kumar Singh, A-5 Moolchand Shah and A-9 Paltan Mallah @ Ravi were convicted by the Sessions Judge for the offence under section 302 read with section 120B. A-9 Paltan Mallah was found guilty of the offence punishable under section 302 IPC and sentenced to capital punishment whereas other accused were sentenced to life imprisonment. The High Court by the impugned Judgment acquitted all the accused of the charges framed against them.

Deceased Shankar Guha Niyogi was a popular, powerful trade union leader in the industrial region of Bhillai, Durg, which was part of the then State of Madhya Pradesh.

25. *State of Madhya Pradesh v Paltan Mallah,* AIR 2005 SC 733 : 2005 AIR SCW 455 : 2005 Cr LJ 918 (SC).

Deceased Shankar Guha Niyogi had been working for the welfare of the labour demanding living wages, bonus, reinstatement of retrenched workers and he organised the workers of the various industrial units at Bhillai and Durg. The labourers had an organisation by name "CHATTISGARH MUKTI MORCHA" (hereinafter being referred to as CMM") and deceased Niyogi became a leader of this organisation. He was leading the labourers working at Rajaram Mines area which was a main source of raw material iron ore for the Bhillai Steel Plant at Durg. In the year 1989, there was an agitation by the workers of industrial unit by name ACC, which is a leading cement manufacturer. A settlement was reached at the instance of deceased Niyogi. The workers in other industrial establishments sought the help of deceased Niyogi to solve their problems. In the year 1990, he came to Bhillai and started occupying quarter No. MIG 1/55 of HUDCO. He stayed there with his servant Bahal Ram. The other members of his family continued to stay near Rajhara. Deceased Niyogi set up an office for CMM at MIG-2/273 HUDCO. In the year 1990, there was widespread labour movement against the management of various industrial units such as Simplex, Kedia, B.E.C. B.K, etc. According to the prosecution, the management of these industrial units started opposing the labour movement and there was even physical attack on some of the leaders of CMM. One Uma Shankar Rai, a leader of CMM was fatally assaulted by the agents of the industrialists. Deceased Niyogi apprehended serious threat to his life from the industrialists, especially from Simplex and Kedia Group of Industries. He made notes in his diary regarding the apprehension of danger from the management of these industrial units. On 27-9-1991, he had gone to Raipur and there he met one Rajendra Sail, Secretary General of PUCL and reporter N.K. Singh of "India Today". He expressed an apprehension of danger to his life from Kedia and also from A-5 Moolchand Shah and A-l Chandrakant Shah of Simplex Group. On 27-9-1991 at about midnight, he left Raipur for Bhillai and reached his quarter No. MIG- 1/55 of HUDCO and went to bed. His servant Bahal Ram was occupying the neighbouring room. In the night, Bahal Ram heard a noise like bursting of crackers and he rushed to the room of Niyogi and found Niyogi writhing in pain on his bed. The window was found open. Bahal Ram called for help of the neighbour Sripad Mategaonkar. Few workers from the CMM came to the place and it was found that Niyogi had been shot. He was immediately taken to the Sector 9 Hospital of Bhillai. Before reaching the hospital, Niyogi succumbed to the gun shot injuries. Post-mortem examination was conducted by a team of doctors and they opined that death was due to bullet injuries.

Preliminary investigation was carried out by PW-182 Deputy Superintendent of Police Shri M.G. Agarwal. There was agitation by the workers that investigation shall be conducted by the Central Bureau of Investigation and the Government of Madhya Pradesh requested the Union of India seeking help of the Central Bureau of Investigation. As part of police investigation, PW-182 visited the scene of occurrence and got prepared map of the site and he took steps to see that viscera of the victim was sent for laboratory tests. He took into custody the pellets recovered from the body of Niyogi. He took statements from Bahal Ram, the servant and also from the widow and daughter of deceased. He got prepared photograph Exh. P-180 to P-196. He got report from Serum Science and Chemical Analysis which are marked as Exh. P-430 to P-432. He recorded statements of various other witnesses. Accused A-3 Avdhesh Rai was taken into custody on 13-10-1991. On 1-11-1991, he seized diary of deceased Niyogi and on 9-11-1991 he handed over the investigation to CBI officials.

PW-187 R.S. Dhankad took over the investigation along with PW 192 R.S. Prasad. PW-187 held search of Oswal Industry. He recorded the statements of Zakkiruddin on 21-11-1991. This witness identified the photographs of A-2 Gyan Prakash Mishra and A-3 Abhay Kumar Singh. PW-192 conducted further investigation of the case along with other officers. On 10-11-1991, he seized the window curtains from the house of Niyogi. On 15-11-1991, he conducted searches of the business premises of Jain and Shah and Company, 108 A. Khan Goga Complex and recovered articles under Exh. P-297.

After the arrest of accused Paltan Mallah on 25-8-1993, he got recovered .12 bore country made weapon, 13 live cartridges of 12 bore, a foreign made

revolver, 6 live cartridges of .38 bore and a red colour Suzuki Motorcycle. He sent Exhs. P-403 and 404 to Central Forensic Laboratory (CBI), New Delhi. He conducted various other searches and recovered incriminating articles from the other accused. After investigation, the final report was filed.

On the side of prosecution PW-1 to PW-192 were examined by the trial court.

The High Court by the impugned judgment acquitted all the accused and that is challenged before us.

Then the most important item of evidence against the accused, Paltan Mallah, is the report of the ballistic expert. PW-192, the Deputy Superintendent of Police of the CBI deposed that after the arrest of the appellant Paltan Mallah on 25-8-1993, he recovered one .12 bore improvised pistol, 13 live cartridges .12 bore, one foreign made pistol, 6 live cartridges of .38 bore and a motorcycle. The improvised pistol, the foreign made pistol and the cartridges were sent for examination by the ballistic expert to the Central Forensic & Science Laboratory, New Delhi. During the post-mortem of the deceased Shankar Guha Niyogi, three pellets were extricated from his body. These pellets were sent to Forensic Laboratory at Sagar and thereafter they were deposited in the court by PW-192 and these pellets were also later on obtained from the court and sent for examination by the CFSL. PW-159, the ballistic expert conducted detailed laboratory test-fires and microscopic examination and he gave Exh. P-398 report wherein he opined that three lead pellets marked P-1 to P-3 must have been fired from a .12 bore improvised pistol. He deposed that he had prepared the report on the basis of the microscopic examination and he had also taken photographs of the pellets and Exh. P-398 are the work-sheets of the report prepared by him.

The evidence of PW-159 and his report are seriously challenged by the counsel for the respondent accused. He extensively referred to the text books written by foreign ballistic experts such as Burrad, Hatcher and Taylor. It was argued that in the instant case, the weapon was an improvised pistol and the barrel was not grooved and there was absolutely no question of any identifiable marking coming on the pellets to enable the expert to give any opinion whatsoever. Reliance was placed by him on the observations of this Court in Ram Avtar v Ram Dhavi, (1997) 2 SCC 263: 1996 AIR SCW 4264: AIR 1997 SC 107: 1996 All LJ 1908 wherein this Court relied on the opinion of J.S. Hatcher in his text book of Firearms & Investigation to the effect that "unless there were rifling marks in the bullets which were not defaced by the entry in the bodies of the victims, no expert can ordinarily and generally give an opinion. It was also pointed out that in the case of improvised pistol, it was difficult to assume that the ballistic expert could have found identifying marks on the pellets. The evidence given by the ballistic expert was questioned in great detail. He was cross-examined extensively by counsel for all the accused. He deposed in the cross-examination that when these pellets are fired, then they among themselves would press each other inside the barrel [on inside parts] their effect could be on one side of inner side of barrel, they will take special individual mark on them and these marks will be in the form of a line on the pellets and if the barrel is tight then pellets will be more rubbed, and on more parts, lines will come. If barrel is tight then half part of the pellets are pressed and the barrel was nicely tight and the witness himself said that in the test fire which he did on all of the six pellets good marks of barrel had come. He had also stated that he had taken micro-photograph of only one pellet and had compared all pellets but he had not made any separate comparative record or photograph.

It was argued that micro-photographs were not produced and mere observation by the expert—was not sufficient and that he should have produced these photographs. We do not think that there was any such necessity to produce the micro photographs when the expert has given convincing reasons to support his opinion.

This Court. in *Ramanathan v State of Tamil Nadu,* (1978) 3 SCC 86 : 1978 Cr LJ 1137 : AIR 1978 SC 1204 para 26 held that the production of such photographs is not necessary and such a plea was rejected. In paragraph 26, it was held as under:

> *"It is true that there has been considerable difference of opinion amongst investigators regarding the use of photographs in a court for the purpose of illustrating the matching of the markings, and while it may be that microscopic photographs, when taken with due care and in the best of conditions, may enable the evidence to be placed on the record in a visible form, it cannot be denied that a court would not be justified in rejecting the opinion of an expert who has examined the markings under the comparison microscope simply for the reason that he has not thought it necessary to take the photographs. It is therefore not possible for us to reject the evidence of Ramiah (PW-23) who has categorically stated that he had compared the land and groove markings on the bullets under a comparison microscope, simply because he did not think it necessary to take the photographs."*

In the case of the respondent-accused Paltan Mallah, there is overwhelming evidence to prove his complicity in the crime. The recovery of the improvised pistol at his instance, which is proved to have been used for causing the death of Shankar Guha Niyogi; and the evidence of the ballistic expert coupled with two extra-judicial confessions made to PW-105 made PW-124 support the prosecution case fully. There is also prosecution evidence to the effect that the accused had got accessibility to the weapons and that he was staying at the place of occurrence and doing various jobs. It is also established that accused Paltan Mallah is involved in other offences relating to firearms. Though there is no direct and convincing evidence against other accused, the case against Paltan Mallah is proved beyond reasonable doubt. He was acquitted by the High Court on fanciful reasons. The evidence of extra-judicial confessions was rejected without any valid reasons. The report of the ballistic expert also was not appreciated in the correct perspective by the High Court. In our view, the Division Bench seriously erred in acquitting the respondent-accused Paltan Mallah.

In the result, we reverse the acquittal of the respondent-accused Paltan Mallah. The incident leading to these appeals had taken place as early as 1991. As there is a long lapse of time, we do not think that the sentence of death imposed upon him by the Sessions Court is justified in the circumstances. We set aside the acquittal of respondent-accused Paltan Mallah and find him guilty of the offence punishable under section 302 IPC and sentence him to undergo imprisonment for life.

37.15 GUIDELINES FOR SELF-DEFENCE IN GUNSHOT FIRE[26]

Author's Summary

It is a case of murder in a family dispute; a 12 bore shotgun was used. The main point to determine was whether the injured 2 eyewitnesses were really injured or not . The absence of pellets in their injuries nailed the lie. The SC believed that the firing/killing was in self-defence. The SC also laid guideline to identify a self-defence case.

Highlights italicised

Relevant Extracts (Verbatim)

Brief facts which are necessary to dispose of this appeal are recapitulated as under:—

> The dispute is between very close and intimate family members. Deceased Gurcharan Singh was the brother of Bakhtawar Singh and uncle of Darshan Singh. He was the father of Gurdish Singh, PW-7, the informant. The agriculture fields of both brothers, Gurcharan Singh and Bakhtawar Singh were situated adjoining to each other. According to the prosecution, on 15-7-1991 at about 8 a.m. Gurdish

26. *Darshan Singh v State of Punjab*, AIR 2010 SC 1212 : 2010 AIR SCW 832 : 2010 Cr LJ 1393.

Singh, PW-7 and his father, Gurcharan Singh were irrigating their aforesaid fields and were also mending its ridges and at that time Gurdev Singh, PW-8 and Ajit Singh were also present there. In the meantime, Darshan Singh and Bakhtawar Singh came there from the side of their fields raising lalkaras and abused the complainant party. Darshan Singh, accused was armed with D.B.B.L. gun and his father Bakhtawar Singh was carrying a Gandasa and they were saying that they would teach a lesson to the complainant party for cutting the ridges.

5. According to the further story of the prosecution, Bakhtawar Singh gave a Gandasa blow causing injuries on the chest of Gurcharan Singh. Gurcharan Singh was also having a Gandasa with him and in order to save himself he also caused injury on the head of Bakhtawar Singh. Thereafter, Darshan Singh fired two shots from his licensed gun which hit Gurcharan Singh in the chest and some of the pellets hit Gurdish Singh PW-7 on his left upper arm and Gurdev Singh, PW-8 on his left thigh. Gurcharan Singh fell down and died at the spot. Gurdish Singh and others retraced their steps in order to save themselves. Both the accused in order to save themselves ran towards their respective houses. The prosecution examined 11 witnesses. Dr. Mukesh Gupta, PW-4 who conducted the post-mortem examination found the following injuries on the dead body of Gurcharan Singh:—

"1. There were 14 wounds in an area of 20 cm x 18 cm on the left side of the chest above the nipple. One of the wounds which was above the nipple was having inverted margins. A wad was recovered from this wound. This wound was 1 cm x 1 cm. The 9 wounds which measured 0.75 cm x 0.75 cm which were on the chest and shoulder also had inverted margins. Out of these wounds 6 were found to entering chest cavity and 6 pellets were recovered from the chest cavity. The remaining 3 wounds were having everted margins. These were near the axilla and each wound measured 1 cm x 1 cm. One of the 14 wounds which measured 0.75 cm x 1.5 cm was having inverted margins. It was skin deep and was on the shoulder, upper part of humerous and clavicle bones were found to be fractured. 4th and 5th rib of the left side of the chest were also found to be fractured.

2. There were 7 wounds in an area of 20 cm x 8 cm on the upper part of the chest on its right side above the nipple. Out of these wounds 3 wounds measuring 0.75 cm x 1 cm each was having inverted margins, these were skin deep. 2 wounds were having everted margins having a dimension of 1 x 1 cm each near the axilla. A pellet was recovered from near the axilla. The remaining 2 wounds were near the top of right shoulder measuring 0.75 x 1.5 cm each with inverted margins. These were skin deep.

3. An incised wound 8 cm x 0.5 cm skin deep on the left side of the chest 3 cm above the nipple. It was horizontally placed."

10. Dr. Mukesh Gupta found following injury on the person of Gurdev Singh:—

"An abrasion measuring 1 cm x 0.5 cm on the front and inner side of left thigh. It was a superficial abrasion reddish in colour, over the junction of upper l/3rd and lower 2/3rd of the thigh. There was damage to the pajama corresponding to the injury."

11. *According to the doctor, the injury was simple in nature and was caused within 24 hours.*

Doctor also found injury on Gurdish Singh to be superficial. The same reads as under:—

"A very superficial abrasion 1 cm x 0.5 cm on the upper side of left upper arm 12 cm above the elbow. It was reddish in colour."

12. It may be relevant to mention that Dr. M.S. Gill, PW-5, who conducted the medical examination of Bakhtawar Singh found the following injuries on his person:—

"1. An incised wound 7 cm x 0.5 cm on the parietal region of the right side of head. It was placed anterior posteriorly. The wound was bone deep and 4 cm above the right pinna, clotted blood was present."

13. According to the doctor, this injury was caused by sharp-edged weapon.

* * *

21. The trial court after discussing the entire evidence came to the conclusion that two counter versions of the case have been presented and, in the view of the trial court, the defence version is more probable and nearer to the truth for the following reasons:

(i) The delay in lodging the FIR impels the court to scrutinise the evidence of witnesses regarding the actual occurrence with greater care and caution.

(ii) The crucial point to be decided in this case was that who was the aggressor or which of the parties can have the motive to open the attack?

The trial court held that "if the accused were already cultivating the land as per compromise, then it does not appeal to reason as to why they would feel aggrieved. On the other hand there was strong motive for Gurcharan Singh to assault the accused person as he has resiled from the compromise."

(iii) The next crucial point according to the trial court was as to where the incident took place? According to the trial court the incident had taken place in the field of the accused.

(iv) According to the trial court, the presence of the prosecution witnesses Gurdev Singh and Gurdish Singh at the time of alleged occurrence is highly doubtful. Dr. Mukesh Gupta stated that the injuries on Gurdev Singh and Gurdish Singh could be caused by friendly hands and can be self-suffered.

(v) No pellet was recovered from the injuries of the prosecution witnesses namely, Gurdev Singh and Gurdish Singh. The possibility of the injuries on their persons having been fabricated at a later stage cannot be ruled out.

The trial court found that, in the instant case, it appeared that the inquest report was prepared first and the FIR was prepared at some later stage because there was no mention about the injuries of Gurdev Singh and Gurdish Singh in the inquest report, whereas this fact is mentioned in the FIR. According to the prosecution case, Gurdish Singh suffered a pellet injury on his left upper arm whereas, Gurdev Singh was hit on his left thigh. This was so mentioned in the FIR. If it was so, this fact would have been mentioned in the inquest report or the Investigating Officer must have prepared their injury statement, but no such injury statement was prepared at the spot nor their medical examination was got done.

In the cross-examination, Om Prakash ASI had admitted that he came to know about the injuries of Gurdish Singh and Gurdev Singh only when they gave their supplementary statements at the bus stand. The finding of the trial court is that the injuries were fabricated with the connivance of the Investigating Officer just in order to make Gurdish Singh and Gurdev Singh stamp witnesses.

(vi) Gurdish Singh PW-7 had admitted that his father Gurcharan Singh was face to face when Bakhtawar Singh gave Gandasa blow from above to downward vertically on the chest of Gurcharan Singh. However, Dr. Mukesh Gupta contradicted him and stated that injury No. 3 on the person of Gurcharan Singh was skin deep and was horizontally placed and was possible by a fall on a sharp edged weapon.

From this it can safely be concluded that it was not Bakhtawar Singh who gave Gandasa blow to Gurcharan Singh in the manner as suggested by the prosecution. It is most likely that Gurcharan Singh suffered injury No. 3 by a fall on his own Gandasa and this was the reason that the wound was only skin deep.

The story put forth by the prosecution that Gurcharan Singh was cutting weeds of ridges with Gandasa is not believable. Gurdish Singh stated that he was collecting the cut weeds. They were not having any Kassi or Khurpa and it was not possible to cut weeds of ridges with Gandasa.

(vii) The trial court came to a clear conclusion that Bakhtawar Singh was injured at point 'F' as shown in the site plan at the hands of Gurcharan Singh (deceased). Gurcharan Singh after causing that injury forwarded towards Darshan Singh armed with Gandasa and at that point Darshan Singh had no option but to open fire and Gurcharan Singh died of that firearm injury. The trial court came to the definite conclusion that Darshan Singh fired a shot in his right of private defence.

(viii) The trial court after marshalling the entire evidence came to the conclusion that seeing from all angles, the probabilities of the case are much more in favour of the defence than in favour of the prosecution.

The possibility of the injuries having been caused to Gurcharan Singh by Darshan Singh in exercise of private defence cannot be ruled out. Thus, the prosecution has failed to prove its case against the accused person beyond any reasonable doubt and the benefit has to be given to them.

58. The following principles (for self-defence) emerge on scrutiny of the judgments[27]:

(i) Self-preservation is the basic human instinct and is duly recognized by the criminal jurisprudence of all civilized countries. All free, democratic and civilized countries recognize the right of private defence within certain reasonable limits.

(ii) The right of private defence is available only to one who is suddenly confronted with the necessity of averting an impending danger and not of self-creation.

(iii) A mere reasonable apprehension is enough to put the right of self-defence into operation. In other words, it is not necessary that there should be an actual commission of the offence in order to give rise to the right of private defence. It is enough if the accused apprehended that such an offence is contemplated and it is likely to be committed if the right of private defence is not exercised.

(iv) The right of private defence commences as soon as a reasonable apprehension arises and it is co-terminus with the duration of such apprehension.

(v) It is unrealistic to expect a person under assault to modulate his defence step by step with any arithmetical exactitude.

(vi) In private defence the force used by the accused ought not to be wholly is proportionate or much greater than necessary for protection of the person or property.

(vii) It is well-settled that even if the accused does not plead self-defence, it is open to consider such a plea if the same arises from the material on record.

(viii) The accused need not prove the existence of the right of private defence beyond reasonable doubt.

(ix) The Indian Penal Code confers the right of private defence only when that unlawful or wrongful act is an offence.

(x) A person who is in imminent and reasonable danger of losing his life or limb may in exercise of self-defence inflict any harm even extending to death on his assailant either when the assault is attempted or directly threatened.

In the instant case after marshalling and scrutinising the entire prosecution evidence, we are clearly of the view that the trial court's view is not only the possible or plausible view but it is based on the correct analysis and evaluation of the entire evidence on record. Rationally speaking, no other view is legally possible.

65. Consequently, this appeal is allowed and the impugned judgment of the High Court is set aside and the judgment of acquittal of the trial court is restored. The role attributed to the appellant is fully covered by his right of private defence.

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27. See also *Triloki Nath v State of Uttar Pradesh,* 2005 AIR SCW 5824 : AIR 2006 SC 321 : (2005) 13 SCC 323; *State of Madhya Pradesh v Ramesh*, 2004 AIR SCW 6663 : AIR 2005 SC 1186 : (2005) 9 SCC 705; *James Martin v State of Kerala*, (2004) 2 SCC 203; *Kashmiri Lal v State of Punjab*, AIR 1997 SC 393 : 1996 AIR SCW 3772 : (1996) 10 SCC 471; *Bhagwan Swaroop v State of Madhya Pradesh*, AIR 1992 SC 675 : 1992 AIR SCW 362 : (1992) 2 SCC 406:; *Jagtar Singh v State of Punjab*, AIR 1993 SC 970 : 1993 AIR SCW 70 : 1993 Cr LJ 306. Many other cases have also been cited in the present Judgment.

37.16 NO GUN WORK[28]

Author's Summary

It is a case of murder in which a bar tender was shot dead. The alleged culprit (finally convicted) allegedly fired one shot. The police recovered 2 fired shells from the scene. Firearm(s) was not recovered. The experts failed to interlink/de-link the 2 shells. Defence urged that the second shot, fired by another unknown person, might have killed the victim.

The court was misled to believe that firearms are needed to link/delink the fired shells *inter se.*

Normally two fired cartridges can be identified whether they had been fired from the same or different firearms as the marks left by a particular firearm are unique and individual to that firearm. The firearms are not needed to ascertain the factum. The modern NIBIN (Automatic Comparison Systems) does not require firearm(s) for the identification at all. Previously fired cartridge data is used for comparison/evaluation. There is ample support for the proposition in literature: See: Sharma, BR. Firearms in Criminal Investigation and Trials, V Ed.(2017) Pages 252, 263. Only in rare cases, differentiation is not possible when the marks of the firearm are not printed properly or they are mutilated.

Highlights italicised

Relevant Extracts (Verbatim)

(1) These statutory appeals are filed under section 2(a) of the Supreme Court (Enlargement of Criminal Appellate Jurisdiction) Act, 1970 and under section 379 of the Criminal Procedure Code against the final judgment and order dated 18/20-12-2006 passed by the High Court of Delhi in Criminal Appeal No. 193 of 2006 whereby the High Court reversed the order of acquittal dated 21-2-2006 passed by the Additional Sessions Judge, Delhi, in Sessions Case No. 105 of 2001 and convicted Sidhartha Vashisht @ Manu Sharma (appellant in Crl. A. No. 179 of 2007) under sections 302, 201/120B IPC and section 27 of the Arms Act and sentenced him to undergo imprisonment for life for the offence under section 302 IPC together with a fine of Rs. 50,000 to be paid to the family of the victim and in default of payment of fine, to undergo further imprisonment for three years and also sentenced him to undergo imprisonment for four years for the offence under section 27 of the Arms Act with a fine of Rs. 2000 and in default to further undergo imprisonment for three months. He was further sentenced to undergo imprisonment for four years for the offence under sections 201/120B IPC together with a fine of Rs. 2,000 and, in default, to further undergo imprisonment for three months. The High Court also sentenced Amardeep Singh Gill @ Tony Gill (appellant in Crl. A. No. 157/2007) and Vikas Yadav (appellant in Crl. A. No. 224/2007) to undergo rigorous imprisonment for four years and a fine of Rs. 2000 each and, in default of payment of fine, to further undergo imprisonment for three months under sections 201/120B IPC.

(2) The case of the prosecution:

(a) On night intervening 29/30-4-1999, a 'Thursday Party' was going on at Qutub Colonnade at "Once upon a time" restaurant also called "Tamarind Cafi". The liquor was being served by the bar-tenders, namely, Jessica Lal (since deceased) and one Shyan Munshi (PW-2). At about 2.00 a.m., Sidhartha Vashisht @ Manu Sharma (appellant in Crl. A. No. 179 of 2007) along with his friends came there and asked for two drinks. The waiter did not serve him liquor as the party was over. Jessica Lal and Malini Ramani (PW-6), who were also present there, tried

28. *Manu Sharma v State (NCT of Delhi)*, (2010) 6 SCC 1. (Supreme Court: Criminal Appeal No. 179 of 2007 (with Other appeals); *Sidhartha Vashiht@ Manu Sharma v State (NCT of Delhi),* Judgment: Swatanter Kumar J, decided on 19 April 2010.

to make him understand that the party was over and there was no liquor available with them. On refusal to serve liquor, the appellant took out a pistol and fired one shot at the roof and another at Jessica Lal which hit near her left eye as a result of which she fell down. Beena Ramani (PW-20), who was present there, stopped the appellant and questioned him as to why he had shot Jessica Lal and demanded the weapon from him but he did not hand over the pistol and fled away. Jessica Lal was rushed to Ashlok Hospital from where she was shifted to Apollo Hospital. On 30-4-1999, in the early morning hours, Jessica Lal was declared brought dead at Apollo Hospital.

(b) On the night intervening 29/30-4-1999 at 2.20 a.m., DD Entry No. 41A (Ex. PW-13/A) was recorded at Police Station Mehrauli which disclosed a shooting incident at H-5/6 Qutub Colonnade. A copy of the said DD entry was handed over to SI Sharad Kumar (PW-78) who along with Ct. Meenu Mathew left for the spot. Near about the same time, copy of the said DD entry was also given to SI Sunil Kumar (PW-100) who along with Ct. Subhash also left for the spot. On reaching the spot, PW-78 found that the injured had been removed to Ashlok Hospital and the floor of the Restaurant was found to be wet. SI Sunil Kumar (PW-100) then left SI Sharad Kumar (PW-78) at the spot to guard the same and proceeded to Ashlok Hospital along with Ct. Subhash. The SHO, Police Station Mehrauli, Inspector S.K. Sharma (PW-101) along with his team also left the Police Station *vide* DD Entry No. 43A and reached the spot and deputed one Home Guard Shravan Kumar (PW 30) at the entrance of 'Qutub Colonnade' to guard the vehicles. On reaching Ashlok Hospital, PW-100 met Beena Ramani (PW-20), who is the owner of the Restaurant, and enquired about the incident but she asked him to talk to Shyan Munshi (PW-2) saying that he was inside and he knew everything. PW-100 then recorded the statement of PW-2 and made an endorsement on the same for the registration of the case under section 307 IPC and handed over it to Ct. Subhash to be carried to the police station, Mehrauli. At about 4.00 a.m., FIR No. 287/99 was registered at the police station, Mehrauli. In the meantime, Jessica Lal had been shifted to Apollo Hospital. When SI Sunil Kumar came back to the spot along with PW-2, PW 30 informed them about the lifting of one black Tata Safari from the spot. On inspection of the site, two empty cartridges were seized and, in the meantime, a supplementary statement of PW-2 was also recorded by PW-100. At about 5.45 a.m., PW-100 received an information by Ct. Satyavan intimating him about the death of Jessica Lal at Apollo Hospital. Charge under section 302 IPC/201/120B IPC and under section 27 of the Arms Act has been framed against the accused Sidhartha Vashisht @ Manu Sharma, charge under sections 201/120B IPC has been framed against accused Vikas Yadav, Amardeep Singh Gill @ Tony Gill and Alok Khanna, charge under section 212 IPC has been framed against Harvinder Chopra, Raja Chopra, Vikas Gill @ Ruby Gill and Yograj Singh and charge under sections 201/212 IPC against Shyam Sunder Sharma. At about 7.00 a.m. PW 100 recorded the statement of the Manager (PW-47), Waiter (PW-46) and Beena Ramani (PW-20)-the owner of the Restaurant.

(c) The post-mortem was conducted at about 11.30 a.m. at the All India Institute of Medical Sciences on the same day *i.e.* 30-4-1999. In the meantime, at about 11.00 a.m., SI Pankaj Malik (PW-85) had been sent to Chandigarh to secure the black Tata Safari and to arrest the appellant. PW-100 corded the statements of the witnesses. On 30-4-1999 at about 4.15 p.m., an FIR was registered against Malini Ramani (PW-6), Beena Ramani (PW-20) and George Mailhot (PW-24) under sections 61/68/1/14 of the Punjab Excise Act. At about 8.30 p.m., PW-100 handed over the investigation to SHO S.K. Sharma (PW-101). On the night intervening 30-4-1999/1-5-1999, at about 2 a.m., the police raided the farmhouse of the appellant and on search being conducted seized a photograph of the appellant. On 2-5-1999, a list of invited guests was prepared by PW-24. On the same day, around 10.00 p.m., PW-101, got an information that a black Tata Safari has been found by the U.P. Police (Sector 24, Noida Police Station) and on the next day PW-101 went to Noida Police Station and

seized the said black Tata Safari. On 5-5-1999 at about 2.30 a.m., Amardeep Singh Gill @ Tony Gill and Alok Khanna were arrested and from their alleged disclosure statements, the involvement of Sidhartha Vashisht @ Manu Sharma was confirmed. On the same day, Inspector Raman Lamba (PW 87) who was in Chandigarh with his team intimated the lawyer of the accused-appellant that Manu Sharma is required in the case. On receipt of the information, on 6-5-1999, the appellant surrendered before PW-87 and was later arrested at about 2.20 p.m. and brought to Delhi. On 7-5-1999, the police produced the appellant before the Metropolitan Magistrate and sought police remand for effecting recovery of the alleged weapon of offence. An application for conducting Test Identification Parade (TIP) of the appellant was also moved. Thereafter, the appellant was remanded to five days police custody till 12-5-1999 and thereafter on 12-5-1999 extended till 17-5-1999 on the application of the I.O., but on 15-5-1999, the appellant's remand was preponed from 17-5-1999 to 15-5-1999. On 16-5-1999, the appellant was sent to judicial custody. On 30-5-1999, the accused-Vikas Yadav was also arrested. After the completion of the investigation, the other accused persons were also arrested.

(d) On 3-8-1999, charge-sheet was filed against ten accused persons. On 23-11-2000, the Additional Sessions Judge framed charges against the appellant/Manu Sharma under sections 302, 201 read with section 120B IPC and section 27 of the Arms Act, accused Amardeep Singh Gill was charged under section 120 read with section 201 IPC, accused Vikas Yadav was charged under section 120 read with section 201 IPC as also section 201 read with 34 IPC, accused Harvinder Chopra, Vikas Gill, Yograj Singh and Raja Chopra under section 212 IPC and accused Alok Khanna, Shyam Sunder Sharma and Amit Jhingan were discharged of all the offences. In 2000/2001, Revision Petition No. 596 of 2000 was preferred by the prosecution before the High Court of Delhi praying for the framing of charge against the accused persons and setting aside the discharge of Alok Khanna, Shyam Sunder Sharma and Amit Jhingan. Revision Petitions were also preferred by the accused persons against the framing of the charges against them. The High Court disposed of all the revision petitions filed by the accused persons by a common order dated 13-3-2001. On 12-4-2001, charges as per the orders of the High Court were framed and some of the charges as framed earlier were maintained. Charges under sections 120B/201 IPC were framed against accused Vikas Yadav, Amardeep Singh Gill @ Tony Gill and Alok Khanna and charges under sections 201 and 212 IPC were framed against accused Shyam Sunder Sharma. Against the rest of the accused, the charges as framed on 23-11-2000 by the trial court were maintained. Trial began in May, 2001 against nine accused. In all, 101 witnesses were examined by the prosecution and two court witnesses were also examined.

(e) …….On 28-1-2002, the appellant was released on interim bail for a period of six weeks by the order of the High Court dated 25-1-2002 with a direction to surrender after the expiry of the same. In compliance with the conditions of interim bail, the appellant surrendered on 11-3-2002 but again sought for and granted interim bail for a period of ten weeks starting from 20-3-2002. During the period from March 2002 to February 2006, the appellant was enlarged on bail on different occasions by various orders of the High Court. On one occasion, against the dismissal of the bail application by the High Court on 11-11-2003, the appellant filed a special leave petition before this Court which was dismissed by this Court on 2-12-2003. On 21-2-2006, after trial, the Additional Sessions Judge acquitted all the nine accused including the appellant-Manu Sharma.

(f) Challenging the acquittal, the prosecution filed an appeal before the High Court, being Crl. Appeal No. 193 of 2006. On 20-12-2006, the High Court *vide* the impugned order, convicted and sentenced the appellants, as mentioned in paragraphs above. Challenging the said order of the High Court, all the three appellants filed above mentioned separate appeals before this Court. All the appeals were heard together and are being disposed of by this common judgment.

(64) The evidence in respect of two FSL reports is as under:

By letter dated 6-7-1999, the seized material was forwarded to CFSL for examination and expert opinion and, *inter alia*, the following queries were made to be opined by the CFSL:

"5. Please examine and opine whether the two empties present in parcel mentioned at SI. No. 5 have been fired from the same weapon?

6. Please examine and opine whether the bullet lead in parcel No. 6 and the bullet empties in parcel No. 5 have been fired from a standard firearm or a country made firearm?

7. Please examine and opine whether ejector, trigger, chamber, magazine or other chamber marks are present on the live bullet empties contained in parcel Nos. 6 & 5 respectively?

8. If the answer to query No. 7 is yes them whether these marks are similar and caused by the same firearm?"

The Ballistics Division of CFSL gave report in respect of the queries as under:

"(1) The .22 badly mutilated lead bullet (marked BC/1) of No. 3 could have been fired from a standard .22 caliber firearm.

(2) The two .22 cartridge cases marked C/l and C/2 have been fired from two different .22 caliber standard firearms.

(3) The .22 cartridge (marked C/3) of parcel No. 5 is a live cartridge and no characteristic tool marks (*i.e.* firing pin, ejector, extractor, breech face, magazine or chamber marks etc.) could be observed on this cartridge.

(4) The two .22 cartridge cases (marked C/l & C/2) of parcel No. 4 and the .22 cartridge (marked C/3) of parcel No. 5 have similar Head Stamp of 'C' indicating that they are of the same make. No opinion on their series (lot/batch) could however be given."

According to the State the same also contained inconclusive opinion. It was pointed out that the State has neither relied on the report of the expert Sh. Rup Singh nor had filed it in the trial Court. An application was moved by the accused for the supply of the document and *vide* order dated 14-1-2000, the Metropolitan Magistrate directed that the State will have to supply all the deficient copies and also the remaining CFSL reports sent by CFSL to SHO. The opinion of Sh. Rup Singh, Ballistic expert finally exhibited as Ex. PW 89/DB only says that "it appears that the two cartridge cases are from two different pistols." As rightly pointed out such a vague opinion of the expert can neither be relied upon nor can be any basis to come to a conclusion that there were two persons who had fired two different shots.

(65) With regard to Prem Sagar Manocha PW-95, Ballistic expert at FSL, Jaipur, a specific query being query No. 3 that whether both the empty cartridge cases have been fired from the same firearm or otherwise. In the reply to the said query, the expert opined that no definite opinion could be given on the two .22 bore cartridge cases C-l and C-2 in order to link with the firearm unless the suspected firearm is available to examination.

It was pointed out that the trial court puts a question to the witness and while putting the question first gives a specific fact finding that for reply to Query No. 3, the presence of the firearm was not necessary. This incorrect finding of fact given by the trial court based on no expertise and had resulted in grave miscarriage of justice.

It is well-settled that while giving reports after Ballistic examination, the bullets, cartridge case and the cartridges recovered and weapon of offence recovered are carefully examined and test firing is done at the FSL by the said weapon of offence and then only a specific opinion is given.

(66) It is contended by the learned counsel for the appellant/Manu Sharma that the prosecution tried their level best to suppress the report of the Ballistic expert Shri Rup Singh

which was not favourable to them and that the same was exhibited at the instance of the defence as Ex. PW 89/DB. It has been further argued that while the charge-sheet was filed on 3-8-1999, the police sought an expert opinion practically at the end of the investigation *i.e. vide* letter dated 16-7-1999, Ex. PW-89/DA. At Sl. No. 67 of the charge sheet one finds mention of the letters sent by the SHO seeking the expert opinion. The charge sheet was filed without expert opinion. The accused on seeing Sl. No. 67, approached the committal Court and asked for the expert report. It has been argued that the I.O. had received the opinion in the first week of December, 1999 but did not file the same. On 21-12-1999, the Court directed the prosecution to file the report. The SPP objected to the same on the ground that the order required modification but the same was rejected and on 14-1-2000, the Court again directed supply of the expert report. It has been argued that since the report did not favour the prosecution, the same was withheld. It has been further argued by the defence that failure on the part of the prosecution to bring on record material which is in favour of the accused is a breach of article 21 of the Constitution. It has been argued by the defence that it was improper on the part of the prosecution to condemn a ballistic expert, *i.e.,* Rup Singh without calling him in for cross-examination. It has been further argued by the defence that by virtue of section 293 Cr.P.C, the report is admissible in evidence and that the weapon is not required to show whether the two empties are fired from the same gun and the weapon is only required when one has to determine as to whether a particular weapon was responsible for firing the empties in question. The expert evidence is only good if it appeals to the judicial lines; appreciation of such evidence can only be the work of the Court. Reliance has been placed on *A.E.G. Carapiet v A.Y. Derderian*, AIR 1961 Cal 359 paras 10-14 to assert that every witness must be cross-examined before being discredited. The prosecution cannot challenge the expert at the stage of appeal when his testimony went unchallenged at the stage of the trial.

(67) It has been argued that the Court must lay down in clear terms the duties of a public prosecutor *i.e.*, to tell the truth even if the same is in favour of the accused. Reliance has been placed on rule 16 of the Bar Council of India Rules which are to the said effect. Reliance is further placed on Attorney-Generals Guidelines contained in Archbold Criminal pleadings edition 2003 to say that it is obligatory on the part of the prosecution to disclose all the material. It has been argued that even after an application under section 391 Cr.P.C. has been filed, the prosecution still chose not to call the expert Rup Singh and cross-examine him. Ex. PW-89/DB supports PW-2 and *vice versa*, since his evidence is corroborated by the expert report. The attention of the Court was invited to the results of the examination. As regards the 2nd opinion given by PW-95, it has been argued that this court must assume that the prosecution sought a favourable opinion from the said witness. The said witness obliged them and created confusion by saying that no conclusive opinion can be given without examining the weapon in question.

(67) It was pointed out by the State that the said report of Rup Singh is inadmissible in law since it is a photocopy and, therefore, does not fall within the purview of a report in terms of section 293 of the Code. In other words, in terms of the relevant provisions of the Indian Evidence Act unless the original document is placed for the scrutiny of the Court, no reliance can be placed on the photocopy without leading proper secondary evidence in this regard. In any case, both section 293 and section 294 of the Code which dispense with a formal proof of documents under certain circumstances make it abundantly clear that the documents sought to be relied upon must be the originals.

1. Assuming for the sake of the argument, though not admitting, that the said report of Rup Singh, *i.e.,* Ex. PW-89/DB is admissible even though a photocopy has been placed on record and even though nowhere it has come in evidence that the same *i.e.,* the photocopy has been compared and scrutinized with the original by the Court and then placed on record, the same still loses all credence in the light of the fact that a perusal of the forwarding letter and report would show that there seems to have been some tampering with the said documents since the sequence of numbering of the parcels as between the forwarding letter and the report has been changed by somebody which fact remains unexplained as, therefore, casts a

further doubt on the genuineness of the said report. The report itself with regard to query No. 3 shows that "it appears that the two cartridge cases C-l and C-2 have been fired by two different weapons". This opinion of the expert was vague and on the basis of said opinion no credence can be lent to the fact adverted to by the defence that there were two persons who fired two different shots from two different weapons.

Moreover the said report is oddly silent on query No. 7 of the forwarding letter wherein it was specifically asked about the various markings on the live cartridge and the bullet empties. The stand of the defence that to opine the two cartridge cases are from the same weapon or not the pistol is not required and the pistol is only required when the opinion is sought whether they are from that particular weapon or not cannot be accepted. It is well-settled that when pressure is built inside the cartridge case, which results in the pushing out of the bullet from the barrel, there is difference in the marks to the extent that it may be either clear or unclear and flattened or deepened thus no opinion can be rendered on account of this dissimilarity in the absence of the weapon of offence and test firing.

Further once the report of Rup Singh is rendered inadmissible the two-gun theory of the defence becomes wholly inadmissible and what remains is that the two empties found at the spot are .22 bore cartridges, that the live bullet found in the Tata Safari is a .22 cartridge and that the gun belonging to the appellant is a .22 bore pistol which was used for the commission of the crime of murder of Jessica Lal.

(68) The prosecution obtained another opinion from FSL Rajasthan and the queries made are as under:

"1. Please examine and opine the bore of the two empty cartridges present in the sealed parcel.

2. Please opine whether these two empty cartridges have been fired from a pistol or a revolver.

3. Whether both the empty cartridges have been fired from the same firearm or otherwise."

In response to these queries, the expert opinion of the FSL, Rajasthan is as under:

"1. The caliber of two cartridge cases (C/l and C/2) is .24.

2. These two cartridge cases (C/1 and C/2) appear to have been fired from a pistol.

3. No definite opinion could be given on two .22 cartridge cases (C/1 and C/2) in order to link with firearm unless the suspected firearm is available for examination."

It was pointed out by the State that this opinion also was inconclusive in nature. In the worksheet, it was categorically recorded that the Investigating Officer be informed to make available the suspected firearm used for a definite opinion on linking of C-1 and C-2 with the same firearm or otherwise. The worksheet also records that the firearm involved be sent for definite opinion. At this juncture, it is relevant to note that the trial court posed a leading question as under:

"**Q**. From reply to query No. 3 the presence of the firearm was not necessary. The question was whether the two empty cartridges have been fired from one instrument or from different instruments?

Ans. The question is now clear to me. I can answer the query here and now these two cartridge cases were examined physically and under sterio and comparison microscope to study and observe and compare the evidence and the characteristics marks present on them which have been printed during firing. After comparison, I am of the opinion that these two cartridge cases C/1 and C/2 appeared to have been fired from two different firearms."

The said witness in further cross-examination replied as under:

"There is nothing in the record of the Court on my report on the basis of which I had given this finding that C/1 and C/2 were fired from two different firearms"

The said witness in further cross-examination deposes that no photographs were taken or there is any other evidence to show the basis of opinion given by the witness before the trial court.

(69) The learned senior counsel for the appellant-accused has contended that the contention of the prosecution that the trial court could not have asked the particular Court question to PW-95 is contrary to section 165 Cr.P.C. inasmuch as the power of Judge is very wide. It has been further argued by the defence that the duties of a Presiding Officer are set out in section 165 of the Indian Evidence Act. Reliance is sought to be placed on *Ram Chander v State of Haryana*, AIR 1981 SC 1036 : 1981 Cr LJ 609 : (1981) 3 SCC 191. It has been argued that the judge knew that the issue was whether two empties were fired from the same gun. It has been further argued that the judge has seen Ex. PW-89/DB and, therefore, any judge would have noticed that the controversy was whether these two bullets were fired from the same weapon or not. The judge also found out that this query went to the CFSL and CFSL answered the same. It has been argued that, therefore, the Judge knew that to answer this query weapon was not required. It has been argued that the Court must read in between the lines.

(70) It is pointed out by the State that the contention of the prosecution was that the trial court could not have first put a specific finding of its own opinion to the expert witness and then to ask him questions. Learned Solicitor-General pointed out that in the attempt of the trial court to extract the truth from the said witness, it misdirected itself in law by posing such a question. This is impermissible even as per the judgment in *Ram Chander* (supra) relied on by the defence. This judgment is in fact in favour of the prosecution since the same clearly puts an embargo on the power of a judge to ask questions so as to frighten, coerce, confuse or intimidate the witness. The danger inherent in a judge adopting a much too stern an attitude towards witness has been duly explained in the said decision. The judge cannot ask questions which may confuse a witness. The argument that the judge knew that the issue in question was whether the two empties found on the spot were fired from the same gun is wrong and misleading. The judge knew that as per the charge framed against Manu Sharma it was he alone who was charged with the possession and use of a gun. The judge also knew that the first expert opinion was brought on record at the instance of the accused; the judge further knew that PW-95 had stated in no uncertain terms that no opinion can be given as regards the two empties without receipt of the weapon of offence.

In spite of knowing all this, the judge first put a finding of its own to the witness that he did not need the firearm in question in order to reply as to whether the two empties were fired from the same gun* i.e., *a gun and not the gun. The Court exceeded its power under section 165 of the Evidence Act by putting the question after giving its own finding.

(71) On behalf of the prosecution, it is pointed out that the entire argument of the accused that an expert opinion was sought at the fag end of the charge sheet to seek a favourable opinion in favour of the prosecution in fact suggests that the I.O. in question was oblivious of the fact that such an opinion could work to the detriment of the case of the prosecution *i.e.,* two empties having been fired from the same weapon of offence belonging to accused Manu Sharma. The fact that the I.O. sought to mention at S. No. 67 of the list of documents in the charge-sheet about the forwarding letter to the expert only suggests that the prosecution had no intention of carrying out the act of seeking an expert opinion, is hiding.

The discretion on the part of the I.O. and the superior officers was rightly exercised when they decided not to file the expert report since they realized that the expert report is ambiguous as it uses the term "appear" when it suggests that the two empties appear to have been fired from different weapons. Clearly the said opinion was far from conclusive and would have only created confusion in the case of the prosecution.

Thereafter a second opinion was sought wherein the expert *i.e.*, PW-95 opined that a conclusive opinion can only be given after the receipt of the weapon of offence. The argument that the weapon of offence is not required to determine whether the two bullets have been fired from the same gun is based on the wrong premise that the two empties would necessarily consist of features which would enable an expert in determining the said fact. For instance, as in the case of a handwriting expert who has to give an opinion about two different sets of near identical questioned documents and as to whether the same belong to different persons, if the argument of the accused has to be accepted then the expert should be able to give such an opinion without having in his possession the specimen handwriting and the admitted handwriting of the accused. It is stated that such an approach would render the opinion as that of a layman and not an expert. Similar would be case of a finger print expert who undertakes the process of discovering two different sets of finger print which are in question, without having the specimen or the admitted finger print of the accused in question. In other words,

an expert is only an expert if he follows the well accepted guidelines to arrive at a conclusion and supports the same with logical reasoning which is a requirement of law as laid down in the Indian Evidence Act. In the present case, the moment Rup Singh uses the word "appear" his opinion unsupported by reasons becomes inconclusive and stands discredited for the purpose of placing reliance on. The opinion of Rup Singh was at query No. 7 as to "please examine and opine whether ejector, trigger, chamber, magazine or other tool marks are present on the live bullet and the bullet empties contained in parcel Nos. 6 & 5 respectively."

Though Shri Rup Singh has given opinion qua query No. 5 that the two .22 cartridge cases appears to have been fired from two different .22 caliber standard firearms but his opinion is completely silent on the marks i.e. ejector, trigger, chamber, magazine or other tool marks on the bullet empties (Ex. PW 89/DB). Clearly an option was available to the accused under section 293 Cr.P.C. to call for the witness and ascertain from his for sure that the two empties were in fact fire from two different weapons, however, the accused did not choose to do so in terms of section 293 Cr.P.C. In any case, the opinion of Rup Singh as of today is of little use to the accused for the reasons stated above and since it is both inconclusive and unsupported by any reasoning whatsoever and, therefore, cannot appeal to the judicial mind of this Court. Similar is the case with the expert opinion of PW-95 which is again inconclusive. There is no evidence on record to suggest that PW-95 gave an opinion to oblige the prosecution. On the contrary, his response to the Court question reveals that he was extremely confused as to the issue which had to be addressed by him in the capacity of an expert. In the concluding part of his testimony he reaffirms the opinion given by him which is that without test firing the empties from the weapon of offence no conclusive opinion can be given.

72. It is pertinent to note that the testimony of the experts i.e., Rup Singh exhibited as Ex. PW-89/DB and PW-95 Prem Sagar Minocha exhibited as Ex. PW-95/C-1 in inconclusive. The expert PW-95 Prem Sagar Minocha has stated in his report that it is only on receiving the weapon of offence that a conclusive opinion as to whether the two empties (cartridge cases) found at the spot were fired from the same weapon or from two different weapons could be given.

73. The defence seeks to reply upon the testimony of PW-2 with regard to the two-gun theory put forward. In this regard, the defence seeks to corroborate the said part of PW-2's testimony with the testimony of the two ballistic experts. It has also been contended by the defence that the testimony of a hostile witness must be corroborated by the other reliable evidence on record in order to be admissible. The law is very clear that where a witness for the prosecution turns hostile, the Court may rely upon so much of the testimony, which supports the case of the prosecution and is corroborated by other evidence. PW-2's testimony as regards the identity of the person shooting, is certainly not corroborated by the testimony of the experts since both the experts have given opinions which cannot qualify as the conclusive opinion of experts.

37.17 HANDWRITING IDENTIFICATION AT PAR WITH OTHER EXPERTISE[29]

Author's Summary

It is a judgment that should put the evaluation of Handwriting on an even keel. The SC had been writing so much against the Science that it created a conformational Syndrome in the minds of judiciary. The judgment in this case took the cudgel to set the record of the expertise straight. It is a well-argued judgment and the judiciary has started rethinking about the condemnation. Another judgment (next case) the Sc has followed the line delineated in this case. It is true that SC had accepted and utilised the expertise; however only after showing expressing solidarity with the numerous condemnations**.**

Highlights italicised

Relevant Extract

1. *An expert is no accomplice. There is no justification for condemning the opinion-evidence of an expert to the same class of evidence as that of an accomplice and insist upon corroboration.* The view occasionally expressed that it would be hazardous to base a conviction solely on the opinion of an expert-handwriting expert or any other kind of expert-without substantial corroboration is not, because experts in general, are unreliable witnesses, but because all human judgment is fallible. The more developed and the more perfect a science, the less the chance of an incorrect opinion. The science of identification of handwriting, unlike the science of identification of fingerprints which has attained near-perfection is not quite perfect and the risk is, therefore, higher.

But that is a far cry from doubting the opinion of a handwriting expert as an invariable rule and insisting upon substantial corroboration in every case, howsoever the opinion may be backed by the soundest of reasons.

An expert opinion has to be tested by the acceptability of the reasons given by him. An expert deposes and not decides. His duty is to furnish the judge with the necessary scientific criteria for testing the accuracy of his conclusion so as to enable the judge to form his own independent judgment by the application of these criteria to the facts proved in evidence.

2. *There is no rule of law nor any rule of prudence which has crystallized into a rule of law that opinion evidence of a hand-writing expert must never be acted upon unless substantially corroborated. But having due regard to the imperfect nature of the science of identification of handwriting, the approach should be one of caution. Reasons for the opinion must be carefully probed and examined. All other relevant evidence must be considered.*

In appropriate cases, corroboration may be sought. In cases where the reasons for the opinion are convincing and there is no reliable evidence throwing a doubt, the uncorroborated testimony of a handwriting expert may be accepted. There cannot be an inflexible rule on a matter which, in the ultimate analysis, is no more than a question of testimonial weight.

3. Section 73 of Evidence Act expressly enables the court to compare disputed writings with admitted or proved writings to ascertain whether a writing is that of the person by whom it purports to have been written. If it is hazardous to do so, it is one of the hazards to which a judge and litigant must expose themselves whenever it becomes necessary. In cases where both sides call experts it becomes the plain duty of the court to compare the writings and come to its own conclusion. Where there are expert opinions, they will aid the Court. Where there is none the Court will have to seek guidance from some authoritative text book and the Court's own experience and knowledge.

[*Ram Chander v U.P. State,* AIR 1957 SC.; Ishwari Prasad Misra v Mohammed Isa, [1963] 3, S.C.R. 722; Shashi Kumar v Subhodh Kumar,AIR 1964 SC 529; *Fakhruddin*

29. *Murarilal v State of Madhya Pradesh*, AIR 1980 SC 531 : (1980) 1 SCC 704 : 1980 Cr LJ 396.

v State of Madhya Pradesh, AIR. 1967 SC 1326 : (1967) Cr LJ 1197; Magan Bihari Lal v State of Punjab, AIR 1977 SC 1091, referred to.]

In the instant case the courts below compared the disputed handwriting with the admitted writing of the appellant and found, in conjunction with the opinion of the expert, that the author of the note was the same person. The appellant was not able to say a word against the reasons given by the expert. (b) The note was designed to lay a false trail by making it appear that the murder and the robbery were the handiwork of some frustrated and unemployed graduates expressing their resentment against the world which had shown no regard for their existence.

(c) Had the recovery of the wrist watch of the deceased in February, 1973 at the instance of the appellant been the only circumstance it would have been difficult to link it with the murder which took place ten months earlier in April, 1972. But there is the vital circumstance that a writing made by the appellant was found on the table by the side of the deceased on the day of occurrence. This circumstance, coupled with the recovery of the dead man's watch, was sufficient to hold him guilty of the offence of which he had man's convicted.

37.18 HANDWRITING IDENTIFICATION EVIDENCE ADMISSIBLE[30] (AT PAR WITH OTHER SCIENTIFIC EVIDENCE)

Author's Summary

It is a case of forgery of railway receipt by an employee of the railways; by which consignment was diverted from its destination and contents usurped.

Document expert identified the handwriting of the forger. The three courts, including the SC accepted the expert opinion of the handwriting expert, reiterating that the handwriting expert's opinion alone can be sufficient for conviction , provided it is properly appraised. The culprit was convicted.

Highlights italicised

Relevant Extracts (Verbatim)

In the first place, it may be noted that the appellant was at the material time a Guard in the employment of the Railway Administration with his headquarters at Agra and he had nothing to do with the train by which Wagon No. SEKG 40765 was dispatched from Munda to Bikaner, nor with the train, which carried that wagon from Agra to Ludhiana. He was not a Guard on either of these two trains. There was also no evidence to connect the appellant with the theft of the blank Railway Receipt at Banmore Station. It is indeed difficult to see how the appellant, who was a small employee in the Railway Administration, could have possibly come into possession of the blank Railway Receipt from Banmore Station which was not within his jurisdiction at any time. It is true that B. Lal, the Handwriting Expert, deposed that the handwriting on the forged Railway Receipt Ex. PW-10/A was that of the same person who wrote the specimen handwritings, Ex. PW-27/37/ to 27/57, that is the appellant, but we think it would be extremely hazardous to condemn the appellant merely on the strength of opinion evidence of a Handwriting Expert. It is now well-settled that Expert opinion must always be received with great caution and perhaps none so with more caution than the opinion of a Handwriting Expert. There is a profusion of precedential authority which holds that it is unsafe to base a conviction solely on Expert opinion without substantial corroboration. This rule has been universally acted upon and it has almost become a rule of law. It was held by this Court in *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559, that it is unsafe to treat Expert Handwriting

30. *Alamgir v State (NCT, Delhi)*, AIR 2003 SC 282 : 2002 AIR SCW 4749 : 2003 Cr LJ 456 (SC).

opinion as sufficient basis for conviction, but it may be relied upon when supported by other items of internal and external evidence. This Court again pointed out in *Ishwari Prasad Misra v Mohammad Isa*, AIR 1963 SC 1728 : 1963 BLJR 226 : (1963) 2 SCR 722, that Expert evidence of handwriting can never be conclusive because it is, after all, opinion evidence, and this view was reiterated in *Shashi Kumar Banerjee v Subodh Kumar Banerjee*, AIR 1964 SC 529, where it was pointed out by this Court that Expert evidence as to handwriting being opinion evidence can rarely, if ever, take the place of substantive evidence and before acting on such evidence, it would be desirable to consider whether it is corroborated either by clear direct evidence or by circumstantial evidence. This Court had again occasion to consider the evidentiary value of Expert opinion in regard to handwriting in *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197, and it uttered a note of caution pointing out that it would be risky to found a conviction solely on the evidence of a handwriting expert and before acting upon such evidence, the Court must always try to see whether it is corroborated by other evidence direct or circumstantial. It is interesting to note that the same view is also echoed in the Judgments of English and American Courts, Vide *Gurney v Langlands*, 1822 (5) B and Ald 330, and Matter of Alfred Foster's Will (34 Mich 21). The Supreme Court of Michigan pointed out in the last mentioned case.

Everyone knows how very unsafe it is to rely upon any one's opinion considering the niceties of penmanship – Opinions are necessarily received, and may be valuable, but at best this kind of evidence is a necessary evil.

We need not subscribe to the extreme view expressed by the Supreme Court of Michigan, but there can be no doubt that this type of evidence, being opinion evidence is by its very nature, weak and infirm and cannot of itself form the basis for a conviction. We must, therefore, try to see whether, in the present case, there is, apart from the evidence of the Handwriting Expert B. Lal, any other evidence connecting the appellant with the offence.

In our view, however, reliance in Magan (supra) is rather misplaced in the contextual facts since no conviction is based on the opinion of the Handwriting Expert but admittedly it can be relied upon when supported by other items of internal and external evidence. The Handwriting Expert's opinion simply corroborates the circumstantial evidence and as such we are unable to record our concurrence with the submissions of Mr. Singh on this score.

Significantly, this Court in Murarilal v State of Madhya Pradesh, AIR 1980 SC 531: (1980) 1 SCC 704: 1980 Cr LJ 396, in no uncertain terms observed that the hazard in acceptance of opinion of an Expert is not because it is unreliable evidence, but because human judgment is fallible. Needless to record that the signs of identification of handwriting have attained more or less a state of perfection and the risk of an incorrect opinion is practically non-existent. This Court went on further to record that doubting the opinion of a Handwriting Expert ought to be a far cry and insistence upon further corroboration as an invariable rule does not seem to be a justifiable conclusion.

In continuation of the above-noted principle, this Court went on to further examine as regards judicial precedence and in that vein stated in paragraph 7 of the report as below:

> *"7. Apart from principle, let us examine if precedents justify in variable insistence on corroboration. We have referred to* Phipson on Evidence, Cross on Evidence, Roscoe on Criminal Evidence, Archibald on Criminal Pleadings, Evidence and Practice and Halsbury's Laws of England *but we were unable to find a single sentence hinting at such a rule. We may now refer to some of the decisions of this Court. In Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559, *Jagannadhadas, J. observed: "It may be that normally it is not safe to treat Expert evidence as to handwriting as sufficient basis for conviction". "May" and "normally" make our point about the absence of an inflexible rule. In* Ishwari *Prasad Misra v Mohammad Isa*, AIR 1963 SC 1728 : 1963 BLJR 226 : (1963) 2 SCR 722, *Gajendragadkar, J. observed;*

"Evidence given by Experts can never be conclusive, because after all it is opinion-evidence", a statement which carries us nowhere on the question now, under consideration. Nor, can the

statement be disputed because it is not so provided by the Evidence Act and, on the contrary, section 46 expressly makes opinion-evidence challengeable by facts, otherwise irrelevant. And as Lord President Cooper observed in Davis v Edinburgh Magistrate, *AIR 1953 SC 34: "The parties have invoked the decision of a judicial tribunal and not an oracular pronouncement by an Expert."*

As regards the decision of *Magan* (supra) this Court in paragraph (10) stated as below:

"10. Finally, we come to *Magan Bihari Lal* v *State of Punjab*, AIR 1977 SC 1091 : 1977 Cr LJ 711 : (1977) 2 SCC 210, upon which Sri R.C. Kohli, learned counsel, placed great reliance. It was said by this Court:

……but we think it would be extremely hazardous to condemn the appellant merely on the strength of opinion evidence of a Handwriting Expert. It is now well-settled that Expert opinion must always be received with great caution and perhaps none so with more caution than the opinion of a Handwriting Expert. There is a profusion of precedential authority which holds that it is unsafe to base a conviction solely on Expert opinion without substantial corroboration. This rule has been universally acted upon and it has almost become a rule of law.

It was held by this Court in *Ram Chandra v State of Uttar Pradesh*, AIR 1957 SC 381 : 1957 Cr LJ 559, that it is unsafe to treat Expert Handwriting opinion as sufficient basis for conviction, but it may be relied upon when supported by other items of internal and external evidence. This Court again pointed out in *Ishwari Prasad Misra v Mohammad Isa*, AIR 1963 SC 1728 : 1963 BLJR 226 : (1963) 2 SCR 722, that Expert evidence of handwriting can never be conclusive because it is, after all, opinion-evidence, and this view was reiterated in *Shashi Kumar Banerjee v Subodh Kumar Banerjee*, AIR 1964 SC 529, where it was pointed out by this Court that Expert evidence as to handwriting being opinion-evidence can rarely, if ever, take the place of substantive evidence and before acting on such evidence, it would be desirable to consider whether it is corroborated either by clear direct evidence or by circumstantial evidence. This Court had again occasion to consider the evidentiary value of Expert opinion in regard to handwriting in *Fakhruddin v State of Madhya Pradesh,* AIR 1967 SC 1326 : (1967) 1 SCWR 449 : 1967 Cr LJ 1197, and it uttered a note of caution pointing out that it would be risky to found a conviction solely on the evidence of a Handwriting Expert and before acting upon such evidence, the Court must always try to see whether it is corroborated by other evidence, direct or circumstantial.

The above extracted passage, undoubtedly, contains some sweeping general observations. But we do not think that the observations were meant to be observations of general application or as laying down any legal principle. It was plainly intended to be a rule of caution and not a rule of law as is clear from the statement "it has almost become a rule of law". "Almost", we presume, means, "not quite". It was said by the Court there was a "profusion of precedential authority" which insisted upon corroboration and reference was made to Ram Chandra v State of Uttar Pardesh; Isdhwari Prasad v Mohammad Isa; Shashi Kumar v Subodh Kumar and Fakhruddin v State of Madhya Pradesh. We have already discussed these cases and observed that none of them supports the proposition that corroboration must invariably be sought before opinion-evidence can be accepted. There appears to be some mistake in the last sentence of the above extracted passage because we are unable to find in Fakhruddin v State of Madhya Pradesh, any statement such as the one attributed. In fact, in that case, the learned judges acted upon the sole testimony of the Expert after satisfying themselves about the correctness of the opinion by comparing the writings themselves. We do think that the observations in Magan Bihari Lal v State of Punjab, must be understood as referring to the facts of the particular case."

In fine, in *Murarilal* (supra) this Court stated that there is no rule of law, nor any rule of prudence which has crystallised into a rule of law that opinion evidence of a Handwriting Expert must never be acted upon, unless substantially corroborated.

We feel it expedient to record our concurrence therewith, though, however, we hasten to add that since human judgment cannot be said to be totally infallible, due caution

shall have to be exercised and the approach ought to be that of care and caution and it is only upon probe and examination the acceptability or creditworthy of the same depends. The learned Sessions Judge, as also the High Court, did place upon consideration of all relevant facts and material on record, reliance on the opinion of the Handwriting Expert and we do not see any reason to record a contra finding.

37.19 SPECIMENS u/s 73, IEA[31,32]

Author's Summary

It is a simple case of interpreting the power of the court u/s 73 of the IEA. The SC ruled that the court has no powers to order any person to give specimen writing in cases under investigation. However, during trials if the court needs specimens for its own scrutiny, it have the powers to order**.** Addition of Section 311 A in Cr P C has, now, given powers to order specimens during investigation.

Highlights italicised

Relevant Extracts (Verbatim)

We shall examine the circumstances highlighted. So far as ransom notes are concerned, prosecution sought to rely upon the report given by the handwriting expert. It appears that the accused was taken before Addl. Chief Judicial Magistrate, Bhiwani. According to him, on 10-9-1991 the accused was brought before him in custody for giving his specimen signature under section 73 of the Evidence Act. It was noticed by this Court in *State of Uttar Pradesh v Ram Babu Misra*, AIR 1980 SC 791 that the Chief Judicial Magistrate has no power to direct the accused to give his specimen signature for comparison during the investigation. Section 73 of the Evidence Act reads as follows:

> *"Section 73—Comparison of signature, writing or seal with others admitted or proved:* In order to ascertain whether a signature, writing, or seal is that of the person by whom it purports to have been written or made, any signature, writing, or seal admitted or proved to the satisfaction of the Court to have been written or made by that person may be compared with the one which is to be proved, although that signature, writing, or seal has not been produced or proved for any other purpose.

The Court may direct any person present in Court to write any words or figures for the purpose of enabling the Court to compare the words or figures so written with any words or figures alleged to have been written by such person.

This section also applies, with any necessary modifications, to finger-impressions".

The second paragraph of section 73 enables the Court to direct any person present in the Court to give specimen writings 'for the purpose of enabling the Court to compare' such writings with writings alleged to have been written by such person.

The clear implication of the words for the purpose of enabling the Court to compare' is that there is some proceeding before the Court in which or as a consequence of which it might be necessary for the Court to compare such writings. The direction is to be given for the purpose of enabling the Court to compare and not for the purpose of enabling the investigating or other agency 'to compare'. If the case is still under investigation there is no present proceeding before the Court in which or as a consequence of which it might be necessary to compare the writings. The language of section 73 does not permit a Court to give a direction to the accused to give specimen writings for anticipated necessity for comparison in a proceeding which may later be instituted in the Court.

31. *State of Haryana v Jagbir Singh*, AIR 2003 SC 4377 : 2003 AIR SCW 5180 : 003 Cr LJ 5054 (SC).
32. The judgment brought Amendment to the law. Section 311A was added to the Code of Criminal Procedure.

37.20 HANDWRITING REPORTS u/s 293 CRPC[33]

Author's Summary

In this case, the report of a handwriting expert was accepted by the appellate court u/s 293 of Cr P C. The expert was not examined. The defence stressed that the report of the expert, without his deposition, is no evidence. The SC agreed with the defence as the document expert is not one of the specified experts in Section 293 of Cr PC . and order to call the expert to prove his report, with opportunity to defence for cross-examination.

Highlights italicised

Relevant Extracts (Verbatim)

Reports of Document Expert not covered under section 293 CrPC

Mr. Singh, learned Counsel for the petitioner submitted that the petitioner has been found guilty solely on the basis of the report of the Government Examiner of Questioned Documents, Exhibit 29, but the expert who submitted the said report was not examined and his report was proved by the Investigating Officer which is not permissible. By referring to sub-section (4) of section293, CrPC, he submitted that report of those government scientific experts mentioned therein can be admitted into evidence without they being examined, but in the instant case the handwriting expert was the Deputy Government Examiner and the said expert is not one of the experts mentioned in sub-section (4) of section 293, CrPC Mr. Pradhan, learned Additional Public Prosecutor, on the other hand, submitted that the conviction of the petitioner is not based solely on the report of the handwriting expert. There is also other evidence on record which justifies his conviction.

I have perused the impugned judgment and on its close scrutiny it appears that the learned Sessions Judge has not discussed the evidence on record at all. In paragraph 7 of the judgment he has referred to the arguments of the Public Prosecutor who seems to have submitted before him that for different offences committed by the petitioner, there is evidence of certain PWs and separate documentary evidence.

It may be stated that as an appellate Court, the learned Sessions Judge is required to assess and consider the evidence on record independently. As a court of appeal, he has to remember and keep in view that the presumption of innocence of the accused continues and therefore, he is to satisfy himself that the judgment of the trial Judge is correct. It is the bounden duty of the appellate Court, which may be the final Court of fact, to go through the evidence for himself, to assess it in proper perspective and to come to an independent finding. On careful examination of the impugned judgment, I have no hesitation to hold that the learned Sessions Judge has failed to discharge his duty as an appellate Court. As indicated above, he has simply summarized the submissions made before him by the leaned Public Prosecutor and has not cared to examine and scrutinize the evidence for himself. For the reasons aforesaid, the impugned judgment is vulnerable and, therefore, the appeal needs rehearing by him.

There appears to be force in the submission of the learned counsel for the petitioner with regard to the report submitted by the Deputy Government Examiner and Assistant Government Examiner of Questioned Documents. Section 293, Cr.P.C. dispenses with the proof of certain documents unless the court itself thinks it necessary to be proved. Sub-section (4) thereof provides that the said section applies to those Government Scientific experts mentioned therein. So far as handwriting expert is concerned, the Director of the Finger Print Bureau has been mentioned as the expert. It means that if the report is submitted by the Director of Finger Print Bureau,

33. *Sonam Tshering Bhutta v State of Sikkim*, 2004 Cr LJ 3136 (SC).
Also see: *Nirmal v State of Punjab*, 2002 Cr LJ 447 : 2001 (4) All Cr LR 219 : 2001 (4) Rec Cri R 623; *State of Maharashtra v Damu Gopinath Shinde*, AIR 2000 SC 1691 (1700) : 2000 AIR SCW 1617 : 2000 Cr LJ 2301.

the same may be admitted into evidence without he being formally examined. But in the present case, Exhibit 29 was not made by the Director of Finger Print Bureau. Therefore, it is necessary that handwriting expert who prepared Exhibit 29 should be examined to prove the contents thereof, in the interest of justice. The learned Sessions Judge is directed to summon the expert and examine him as a witness. For this, the prosecution will take necessary steps. After he is examined, the learned Sessions Judge will give adequate opportunity to the defence to cross-examine the witness. The evidence of the said witness will form part of the record and be available to be considered along with other evidence already on record.

From a perusal of the above it would be clear that section 293, Code of Criminal Procedure applies only to certain experts like Chemical examiner or Assistant Chemical Examiner to the Government. Chief Inspector of Explosives, Director of the Finger Print Bureau, Director, Deputy Director or Assistant Director of a Central Forensic Science laboratory or a State Forensic Science Laboratory and the Serologist to the Government, besides Director of Haffkeine Institute, Bombay.

The report of the handwriting expert, even if it has been given by the expert working in the Forensic Science laboratory, would not be per se admissible under section 293, Code of Criminal Procedure unless the maker of the said report is summoned and examined as a witness and the other side is given opportunity to cross examine the witness. In my opinion, there was absolutely no occasion for the learned Sessions Judge to have observed that the report of the handwriting expert was admissible under section 293, Code of Criminal Procedure and could be allowed to be tendered into evidence without summoning the author of the report.

In *State of Maharashtra v Damu Gopinath Shinde,* 2000 AIR SCW 1617 : 2000 Cr LJ 2301 : AIR 2000 SC 1691 (1700) opinion of the Assistant State Examiner of documents was produced in evidence as Ex. 64. Under these circumstances, it was held by their Lordships of the Supreme Court that from that description alone, it could not be gathered whether his office would fall within the purview of section 293 Code of Criminal Procedure and hence without examining the expert as a witness in the court, no reliance could be placed on Ex. 64.

In view of the above, in my opinion, even if the prosecution was allowed to produce the report of the handwriting expert by way of additional evidence, the learned Sessions Judge, had gone wrong in allowing the prosecution to tender the said report of the handwriting expert in evidence, without examining the expert and allowing opportunity to the accused to cross-examine him. As referred to above, this was contrary to law, inasmuch as such a report would not be covered under section 293, Code of Criminal Procedure.

For the reasons recorded above, while upholding the order of the learned Sessions Judge, allowing the prosecution to produce the report of the handwriting expert by way of additional evidence, the present petition is partly allowed and the order dated 23-9-2000, passed by the learned Sessions Judge, is modified and

it is directed that for proving the report of the handwriting expert, the prosecution would be given opportunity to examine the expert, who had given the said report and the accused would have the right to cross-examine the said witness.

37.21 TYPEWRITING IDENTIFICATION ADMISSIBLE[34]

Author's Summary

The SC in 1952 has ruled that the identification of typescript/typewriter is not a science and it is not covered under section 45 of the IEA. The present judgment has corrected the lacunae. It is a well-argued judgment supported by authorities. Typescript is now examined under the section 45 IEA. It should be applicable to computer prints also.

Highlights italicised

34. *State (through CBI/New Delhi) v S.J. Choudhary*, AIR 1996 SC 1491 : 1996 AIR SCW 1128 : 1996 Cr LJ 1713.

Relevant Extracts (Verbatim)

The reference made in this appeal to the constitution bench is for deciding the important question of law: Whether the opinion of a typewriter expert is admissible in evidence under section 45 of the Indian Evidence Act, 1872?

The respondent S.J. Chaudhary was being tried in the Court of Additional Sessions Judge, New Delhi, on charges punishable under section 302 of the Indian Penal Code and sections 3 and 4 of the Explosive Substances Act, 1908 in Sessions Case No. 36 of 1983. The prosecution wanted to examine a typewriter expert for proof of certain incriminating facts against the respondent based on the identity of a typewriter on which a material document was alleged to have been typed. An objection was taken to the admissibility of the opinion evidence of the typewriter expert under section 45 of the Indian Evidence Act, 1872 (for short "Evidence Act") based on the decision of this court in *Hanumant Govind Nargundkar v State of Madhya Pradesh*, AIR 1952 SC 343 : 1952 SCJ 509 : 1952 SCR 1091 and the trial court upheld that objection, Criminal Revision No. 105 of 1987 was filed in the Delhi High Court by the prosecution challenging that order. The Delhi High Court has dismissed the revision, hence this appeal by special leave.

The present criminal appeal came up for hearing before a Division Bench comprising of two learned Judges of this court. The correctness of the observations in *Hanumant Govind Nargundkar v State of Madhya Pradesh*, AIR 1952 SC 343 : 1952 SCJ 509 : 1952 SCR 1091 by a Bench of three learned judges on this point was doubted and reconsideration thereof was sought on behalf of the appellant. Accordingly, by order dated March 22, 1990 the Division Bench took the view that this important question of law involved in this appeal should be considered and decided by a larger Bench. This question of law is the only point involved for decision in this appeal and the decision thereon would dispose of the appeal.

In *Hanumant Govind* while dealing with one of the arguments advanced therein, it was stated thus:

> Next it was argued that the letter was not typed on the office typewriter that was in those days, *viz.,* article B, and that it had been typed on the typewriter article A which did not reach Nagpur till the end of 1946. On this point evidence of certain experts was led. The High Court rightly held that opinion of such experts was not admissible under the Indian Evidence Act as they did not fall within the ambit of section 45 of the Act. This view of the High Court was not contested before us. It is curious that the learned judge in the High Court, though he held that the evidence of the experts was inadmissible, proceeded nevertheless to discuss it and placed some reliance on it. The trial magistrate and the learned Sessions Judge used this evidence to arrive at the finding that, as the letter was typed on article A which had not reached Nagpur till the end of December, 1946, obviously the letter was antedated. Their conclusion based on inadmissible evidence has therefore to be ignored."

The above passage in that decision is the basis of the view taken that the opinion of a typewriter expert is not admissible under the Evidence Act and that it does not fall within the ambit of section 45 of the Act. It is significant that this view taken by the High Court in that case was not even contested in this court and, therefore, the decision in *Hanumant* proceeds on the concession that the evidence of a typewriter expert is not admissible in evidence under section 45 of the Act. In our opinion, the decision in *Hanumant* cannot be taken as deciding that point even though on the basis of that observation the evidence of typewriter expert was excluded as inadmissible. This question of law has, therefore, to be answered without any further assistance being available from the decision in *Hanumant*.

In the Indian Evidence Act, 1872, Chapter II relating to 'Relevancy of Facts' contains sections 5 to 55 and therein under the heading 'Opinions of Third Persons, when relevant' are sections 45 to 51. Section 45 reads thus:

> *Opinions of experts.*—When the court has to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting [or finger impressions] (Ins. by Act 5 of 1899, section 3), the opinions upon that point of persons specially skilled in such foreign law, science or art, [or in questions as to identity of handwriting] (Ins.

by Act 18 of 1872, section 4), [or finger impressions] (Ins. by Act 5 of 1899, section 3), are relevant facts.

Such persons are called experts.

Illustration (c) to section 45 is as under:

(c) The question is, whether a certain document was written by *A*. Another document is produced which is proved or admitted to have been written by *A*.

The opinions of experts on the question whether the two documents were written by the same person or by different persons are relevant.

The plain meaning of section 45 is that the court in order to form an opinion upon a point of foreign law, or of science, or art, or as to identity of handwriting, or finger impressions can treat the opinion upon that point of person specially skilled in such foreign law, science or art, or in questions as to identity of handwriting, or finger impressions as relevant facts. In other words, the opinion of persons specially skilled in such foreign law science, or art, or questions as to the identity of handwriting or finger impression, called experts therein, are relevant facts. The opinion of such experts is admissible in evidence as relevant facts by virtue of section 45 of the Evidence Act.

In our opinion, irrespective of the view taken on the question of meaning of the word handwriting in section 45 to include typewriting, the word 'science', occurring independently and in addition to the word 'handwriting' in section 45, is sufficient to indicate that the opinion of a person specially skilled in the use of typewriters and having the scientific knowledge of typewriters would be an expert in this science; and his opinion about the identity of typewriting for the purpose of identifying the particular typewriter on which the writing is typed is a relevant fact under section 45 of the Evidence Act. It is obvious that the Indian Evidence Act when enacted originally in 1872 did not specifically mention typewriting in addition to handwriting because typewriters were then practically unknown. However, the expression 'science', or in section 45 in addition to the expressions 'foreign law' and 'handwriting' use in the section as originally enacted, and the expression 'finger impressions' inserted in 1899 is sufficient to indicate that the expression 'science, or art' therein is of wide import. This expression 'science, or art' cannot therefore, have a narrow meaning in section 45 and each of the words 'science' and 'art' has to be construed widely to include within its ambit the opinion of an expert in each branch of these subjects, wherever the court has to form an opinion upon a point relating to any aspect of science or art.

The meaning of the word 'science' as understood ordinarily with reference to its dictionary meaning must be attributed to the word as used in section 45 of the Indian Evidence Act. Some of the meanings given in the dictionaries are:

The Oxford Encyclopaedic English Dictionary:

Science... a. systematic and formulated knowledge, esp. of a specified type or on a specified subject (political science), b. the pursuit or principles of this....

The New Shorter Oxford English Dictionary, Vol. 2.:

Science..... 2a. Knowledge acquired by study acquaintance with or mastery of a department of learning... 3a. A particular branch of knowledge or study; a recognised department of learning....

Collins Dictionary of the English Language:

Science 1. the systematic study of the nature and behaviour of the material and physical universe, based on observation, experiment, and measurement, and the formulation of laws to describe these facts in general terms. 2. the knowledge so obtained or the practice of obtaining it. 3. any particular branch of this knowledge: the pure and applied sciences. 4. any body of knowledge organised in a systematic manner. 5. skill or technique...

It is clear from the meaning of the word 'science' that the skill or technique of the study of the peculiar features of a typewriter and the comparison of the disputed typewriting with the admitted typewriting on a particular typewriter to determine whether the disputed typewriting was done on the same typewriter is based on a scientific study of

the two typewritings with reference to the peculiarities therein; and the opinion formed by an expert is based on recognised principles regulating the scientific study. The opinion so formed by a person having the requisite special skill in the subject is, therefore, the opinion of an expert in that branch of the science. Such an opinion is the opinion of an expert in a branch of science which is admissible in evidence under section 45 of the Indian Evidence Act.

There cannot be any doubt that the opinion of an expert in typewritings about the questioned typed document being typed on a particular typewriter is based on a scientific study of the typewriting with reference to the significant peculiar features of a particular typewriter and the ultimate opinion of the expert is based on scientific grounds. The opinion of a typewriter expert is an opinion of a person specially skilled in that branch of the science with reference to which the court has to form an opinion on the point involved for decision in the case. In our opinion, on a plain construction of section 45 giving to the word 'science' used therein its natural meaning, this conclusion is inevitable; and for supporting that conclusion, it is not necessary to rely on the further reason that the word 'handwriting in section 45 would also include typewriting.

Statutory Interpretation by Francis Bennion, Second edition, section 288 with the heading "Presumption that updating construction to be given" states one of the rules thus:

> *(2) It is presumed that Parliament intends the court to apply to an ongoing Act a construction that continuously updates its wording to allow for changes since the Act was initially framed (an updating construction). While it remains law, it is to be treated as always speaking. This means that in its application on any date, the language of the Act, though necessarily embedded in its own time, is nevertheless to be construed in accordance with the need to treat it as current law.*

In the comments that follow it is pointed out that an ongoing Act is taken to be always speaking. It is also, further, stated thus:

> *In construing an ongoing Act, the interpreter is to presume that Parliament intended the Act to be applied at any future time in such a way as to give effect to the true original intention. Accordingly the interpreter is to make allowances for any relevant changes that have occurred, since the Act's passing, in law, social conditions, technology, the meaning of words, and other matters. Just as the US Constitution is regarded as a living Constitution, so an ongoing British Act is regarded as 'a living Act'. That today's construction involves the supposition that Parliament was catering long ago for a state of affairs that did not then exist is no argument against that construction. Parliament, in the wording of an enactment, is expected to anticipate temporal developments. The drafter will try to foresee the future, and allow for it in the wording.*
>
> *An enactment of former days is thus to be read today, in the light of dynamic processing received over the years, with such modification of the current meaning of its language as will now give effect to the original legislative intention. The reality and effect of dynamic processing provides the gradual adjustment. It is constituted by judicial interpretation, year in and year out. It also comprises processing by executive officials.*

There cannot be any doubt that the Indian Evidence Act, 1872 is, by its very nature, an 'ongoing Act.'

It appears that it was only in 1874 that the first practical typewriter made its appearance and was marketed in that year by the E. Remington and Sons Company which later became the Remington typewriter. Obviously, in the Indian Evidence Act enacted in 1872 typewriting could not be specifically mentioned as a means of writing in section 45 of the Evidence Act. Ever since then, technology has made great strides and so also the technology of manufacturer of typewriters resulting in common use of typewriters as a prevalent mode of writing. This has given rise to development of the branch of science relating to the examination of questioned typewriting.

In 'Questioned Documents', Second Edition, by Albert S. Osborn in the Chapter of "questioned typewriting" this aspect is considered and, therein at page 598, it is stated thus:

The principles underlying the identification of typewriting are the same as those by which the identity of a person is determined or handwriting is identified. The identification in either case is based upon a definite combination of common or class qualities and features in connection with a second group of characteristics made up of divergences from class qualities which then became individual peculiarities.

The mathematical principles outlined in the fourteenth Chapter show how remote is the possibility of coincidence of even a few scars or deformities on a person, and coincidence of scars and deformities are as remote with typewriters as with persons.

In 'Photographic Evidence' by Charles C. Scott, Second Edition, Volume 1, under the heading "Typewriting Identity or Non-identity of Typing" it is stated thus:

But even as the nationality of an individual may be perplexing but does not in any way hamper the determination of his personal identity by means of his fingerprints, his handwriting, or other reliable indications, so also the fact that it is often difficult to determine the make of a typewriter used in typing a document does not lessen the reliability of the scientific determination that a certain typewritten document was typed on a particular machine regardless of its make. By the use of the proper microscopes and test plates the document examiner often can determine the question and by the use of photographic comparison charts he can demonstrate his findings, usually with unimpeachable certainty.

From a comparison of the typewriting on a document which is a subject of controversy with specimens known to have been made on a certain typewriter it is usually possible to determine whether or not what typewriter was used in typing the subject document, provided the subject document contains sufficient typewriting and the specimens from the known machine are of a suitable kind. This is true because every typewriter when it comes off the assembly line is an individual and writes exactly like no other typewriter. When a typewriter is brand new the differences between it and other typewriters coming off the assembly line at the same time are extremely minute and elusive, but theoretically at least there are identifying differences that can be discovered by microscopic examination and demonstrated photographically. Furthermore, the more a typewriter is used the more individualistic it becomes; and the easier it is to identify its typewriting. In some instances through overuse, misuse, or abuse a typewriter develops so many peculiarities that its typing can be identified readily with the naked eye.

In 'Law of Disputed and Forged Documents' by J. Newton Baker, while dealing with the basic principles of identification of typewriting generally it is stated:

...Since typewriting possesses individuality it can be compared and identified in the same manner as handwriting.....

Therein while discussing individuality of typewriting, it is stated thus:

The individuality of the typewriter is established by the character of its type impression on the paper. These characteristics of typewriting can be analysed, compared and differentiated and can be positively identified as those of a particular typewriter. This individual comparison and identification of characteristics may establish the genuineness or forgery of a typewritten instrument and when admitted in evidence is sufficient proof.

The occurrence of similar irregularities in typewriting in two or more machines is practically impossible. The rule that the typewriter creates for itself a certain distinctive character of writing which identifies one certain machine from all other machines is well-established. To prove that two instruments were written on a particular typewriter similar coincidences of characteristics must be shown in both instruments, and these coincidences considered collectively must demand a single conclusion.

In 'Typewriting Identification (Identification System for Questioned Typewriting)' by Billy Prior Bates, the conclusion of the principles is stated thus:

> *Conclusion.—TYPEWRITING identification is based on the same principle underlying handwriting identification, or any other thing which has a great number of possible variations.*
>
> *The identification of a typewritten document can be likened to the identification of a particular person. A person may be identified in general by his sex, size, features, etc., and in addition, for example, by a radical mastectomy scar. A typewriter may be identified in general by characteristics such as type, design and size, possessed by all machines of a specific make and model, and in addition, for example, by a flaw in the serif on the letter E.*
>
> *No opinion as to identity should be based upon only a few dissimilarities (or similarities). It is the combination of measurements and characteristics which all together make up the conclusion.*
>
> *When good, clear specimens are available in sufficient amount for a scientific identification of the twelve points of comparison, it is possible to show with absolute certainty that a document was, or was not, produced by a particular machine.*
>
> *The mathematical probability of the same combination of these characteristics divergent from the norm appearing in two machines is practically nil. The evidence of the twelve points of comparison can be conclusive proof.*

It is, therefore, clear that the examination of typewriting and identification of the typewriter on which the questioned document was typed is based on a scientific study of certain significant features of the typewriter peculiar to a particular typewriter and its individuality which can be studied by an expert having professional skill in the subject and, therefore, his opinion on that point relates to an aspect in the field of science which falls within the ambit of section 45 of the Indian Evidence Act. Such opinion evidence of experts in the field has long been treated as admissible evidence in similar jurisdictions like the United States as is evident from these standard text books on the subject.

In the present case, even without resort to the word 'handwriting' in section 45 to include typewriting therein, in the view we have taken, the word 'science' is wide enough to meet the requirement of treating the opinion of a typewriter expert as an opinion evidence coming within the ambit of section 45 of the Evidence Act. We may, however, add that the long accepted practice of judicial construction which enabled the reading of the word 'telegraph' to include 'telephone' within the meaning of that word in Acts of 1863 and 1869 when telephone was not invented, would also be available in the present case to read 'typewriting' within the meaning of word 'handwriting' in the Act of 1872. This is so because what was understood by handwriting in 1872 must now in the present times after more than a century of the enactment of that provision, be necessarily understood to include typewriting as well, since typing has become more common than handwriting and this change is on account of the availability of typewriters and their common use much after the statute was enacted in 1872. This is an additional reason for us to hold that the opinion of the typewriter expert in this context is admissible under section 45 of the Indian Evidence Act.

As a result of the above discussion, we hold that the observations made in the above extract in the decision in *Hanumant* on the basis of a concession does not reflect the correct position of law on this point and should, therefore, be treated as no longer good law on the point.

For the aforesaid reasons, we hold that the opinion of the typewriter expert in the present case is admissible under section 45 of the Evidence Act and the contrary view taken by the trial court and the High Court is erroneous. This appeal is accordingly allowed and the impugned orders of the trial court and the High Court are set aside.

37.22 PROOF OF POISONING[35]

Author's Summary

It is a case of murder by poisoning with extreme cunning and planning. The victim was a rich widow. She was being treated for diabetes by the family doctor. He was accompanying her to Mumbai one day. He gave her some poison or an over dose of insulin and she went into comma. He got her admitted in a Mumbai hospital where she died. The medico-legal expert could not find any cause of her death. However, they were sure that she did not die a natural death. The suspicion fell on the doctor. His whole past was investigated. Plenty of circumstantial evidence was found that he had been cheating her and probably he had killed her son also. Besides, his behaviour in handling her after coma was strong evidence of the murder.

All the three court were unanimous in the verdict that the family doctor had murdered the woman.

Highlights italicised

Our findings thus substantially accord on all the relevant facts with those of the two courts below, though the arrangement and consideration of the relevant evidence on record is somewhat different. It is now necessary to consider the arguments which have been advanced on behalf of the appellant. The first contention is that the essential ingredients required to be proved in all cases of murder by poisoning were not proved by the prosecution in this case. Reference in this connection is made to a decision of the Allahabad High Court in *Mt. Gajrani v Emperor*, AIR 1933 All 394 and to two unreported decisions of this court in *Chandrakant Nyalchand Seth v State of Bombay*, decided on February 19 1958.

In these cases, the court referred to three propositions which the prosecution must establish in a case of poisoning:

(a) that death took place by poisoning;

(b) that the accused had the poison in his possession; and

(c) that the accused had an opportunity to administer the poison to the deceased.

The case in Cr. A. No. 98 of 1958, D/-4-11-1958 (SC) turned upon these three propositions. There, the deceased had died as a result of poisoning by potassium cyanide, which poison was also found in the autopsy. The High Court had disbelieved the evidence which sought to establish that the accused had obtained potassium cyanide, but held, nevertheless, that the circumstantial evidence was sufficient to convict the accused in that case. The court did not, however, accept the circumstantial evidence as complete. It is to be observed that the three propositions were laid down not as the invariable criteria of proof by direct evidence in a case of murder by poisoning, because evidently if after poisoning the victim the accused destroyed all traces of the body, the first proposition would be incapable of being proved except by circumstantial evidence. Similarly, if the accused gave a victim something to eat and the victim died immediately on the ingestion of that food with symptoms of poisoning and poison, in fact, was found in the viscera, the requirement of proving that the accused was possessed of the poison would follow from the circumstance that the accused gave the victim something to eat and need not be separately proved, there have been cases in which conviction was maintained, even though the body of the victim had completely disappeared, and it was impossible to say, except on circumstantial evidence, whether that person was the victim of foul play, including poisoning. Recently, this court in *Mohan v State of Uttar Pradesh*,[3] decided on November 5, 1959, held that the proof of the fact of possession of the poison was rendered unnecessary, because the victim died soon after eating *pedas* given by the accused in that case, and he had not partaken any other food likely

35. *Anant Chintaman Lagu v State of Bombay*, AIR 1960 SC 500 : (1960) 2 SCR 460 : 1960 Cr LJ 682 (SC).

to contain poison. In *Dr. Palmer's* case, Notable Trials Series, strychnine was not detected, and the accused was convicted by the jury after Lord Chief Justice Campbell (Cresswell, J. and Mr. Baron Alderson concurring) charged the jury that the discovery of the poison on autopsy, was not obligatory, if they were satisfied on the evidence of symptoms that death had been caused by the administration of strychnine. The conduct of Palmer, which was also significant, was stressed inasmuch as he had attempted to thwart a successful chemical analysis of the viscera and had done suspicious acts to achieve that end. In *Dr. Crippen's* case,[1] the conduct of the accused after the death of Mrs. Crippen in making the friends and relatives believe that Mrs. Crippen was alive, was considered an incriminatory circumstance pointing to his guilt. No doubt, in *Dr. Crippen's* case, the body was found and poison was detected, but there was no proof that *Dr. Crippen* had administered the poison to her, that being inferred from his subsequent conduct in running away with Miss Le Neve. In the second case of this court, the poison was available to the victim, and it was possible that she had taken it to end an unhappy life.

The cases of this court which were decided, proceeded upon their own facts, kept in mind always, the sufficiency of the evidence, direct or circumstantial.

To establish murder by poisoning will depend on the facts of each case. If the evidence in a particular case does not justify the inference that death is the result of poisoning because of the failure of the prosecution to prove the fact satisfactorily, either directly or by circumstantial evidence, then the benefit of the doubt will have to be given to the accused person. But if circumstantial evidence, in the absence of direct-proof of the three elements, is so decisive that the court can unhesitatingly hold that the death was a result of administration of poison (though not detected) and that the poison must have been administered by the accused person, then the conviction can be rested on it.

* * * * *

In (1952) NZLR 111, where the entire case law in England was presented for the consideration of the court, it was pointed out by the court that there was no rule in England that *corpus delicti* must be proved by d irect evidence establishing the death of the person and further, the cause of that death. Reference was made to *Evans v Evans*,[2] where it was ruled that *corpus delicti* might be proved by direct evidence or by "irresistible grounds of presumption". In the same case, it has been pointed out that in New Zealand the court upheld numerous convictions, where the body of the victim was never found.

The rule of law stated by Sir Matthew Hale in Pleas of the Crown Vol. 2, p. 290, that "I would never convict any person of murder or manslaughter, unless the fact were proved to be done, or at least the body found dead" was not accepted in this and other cases. Lord Goddard also rejected the statement as one of universal application, in the case to which we have already referred.

The case of *Mary Ann Nosh*,[1] is illustrative of the proposition that even though the cause of death may not appear to be established by direct evidence the circumstances of the case may be sufficient to infer that a murder has been committed. In that case, the prisoner had an illegitimate son, 5 years old. There was evidence to show that the mother desired to put the child out of her way. One day in June, 1907, the mother left the house and returned without the child. She made several statements as to what had happened to the child, which were found to be untrue. As late as April 1908, the body of a child was discovered in a well. Decomposition had so far advanced that even the sex of the child could not be determined. There was nothing, therefore, to show whether death was natural or violent, or whether it had occurred before or after the body was put into the well. The case was left to the jury. On appeal, it was contended that there being no proof of how death took place, the judge should not have left the case to the jury but ought to have withdrawn it. Lord Chief Justice delivering the judgment of the Court of Appeal referred to the untrue statements of the prisoner about the whereabouts of the child, and observed as follows:

All these statements were untrue. She had an object in getting rid of the child, and if it had been lost or met with an accidental death, she had every interest in saying so at once. It is said there is no evidence of violent death, but we cannot accept that Mr. Goddard cannot

have meant that there must be proof from the body itself of a violent death....In view of the facts that the child left home well and was afterwards found dead, that the appellant was last seen with it, and made untrue statements about it, this is not a case which could have been withdrawn from the jury.

* * * * *

A case of murder by administration of poison is almost always one of secrecy. The poisoner seldom takes another into his confidence, and his preparations for the commission of the offence are also secret. He watches his opportunity and administers the poison in a manner calculated to avoid its detection. The greater his knowledge of poisons, the greater the secrecy, and consequently the greater the difficulty of proving the case against him. What assistance a man of science can give he gives; but it is too much to say that the guilt of the accused must, in all cases, be demonstrated by the isolation of the poison, though in a case where there is nothing else such a course would be incumbent upon the prosecution. There are various factors which militate against successful isolation of the poison and its recognition. The discovery of the poison can only take place either through a post-mortem examination of the internal organs or by chemical analysis. Often enough, the diagnosis of poison is aided by the information which may be furnished by relatives and friends as to the symptoms found on the victim, if the course of poison has taken long and others had an opportunity of watching its effect. Where, however, the poison is administered in secrecy and the victim is rendered unconscious effectively, there is nothing to show how the deterioration in the condition of the victim took place and if no poison but the disease is suspected, the diagnosis of poisoning may be rendered difficult. In *Champman's* case. Notable Trials Series, the victim (Maudmarsh) was sent to Guys Hospital, where the doctors diagnosed her condition to be due to the various maladies "including cancer, rheumatism and acute dyspepsia." It is clear that doctors can be deceived by the symptoms of poison into believing that they have a genuine case of sickness on hand. In *Dr. Palmer's* case, Notable Trials Series, two medical witnesses for the defence diagnosed the case from the symptoms as being due to Angina Pectoris or epilepsy with the tetanic complications.

The reason for all this is obvious. Lambert in his book, "*The Medico-Legal Post-mortem in India*" (pp. 96, 99-100) has stated that the pathologist's part in the diagnosis of poisoning is secondary and has further observed that several poisons, particularly of the synthetic hypnotics and vegetable alkaloids groups, do not leave any characteristic signs which can be noticed on post-mortem examination, (see Modi's "*Medical Jurisprudence and Toxicology*", 13th Edition, pages 450-451 and Taylor's "*Principles and Practice of Medical Jurisprudence*", Volume II, page 229). The same is stated by Otto Saphir in his book "*Autopsy*" at pp. 71 and 72. In Dreisbach's "*Handbook of Poisons*" 1955, it is stated that pathological findings in deaths from narcotic analgesics are not characteristic. He goes further and says that even the laboratory findings are non-contributory. The position of the pathologist who conducts a post-mortem examination has been summed up by Modi in "*Medical Jurisprudence and Toxicology*", 13th Edn., p. 447 as follows:

In order to make a probable guess of the poison and to look for its characteristic post-mortem appearances, it is advisable that a medical officer, before commencing a post-mortem examination on the body of a suspected case of poisoning, should read the police report and endeavour to get as much information as possible from the relatives of the deceased regarding the quality and quantity of the poison administered, the character of the symptoms with reference to their onset and the poison and the development of the first symptoms, the duration of the illness, nature of the treatment adopted, and the time of death. He will find that in most cases the account supplied by the police and the relatives is very meagre, or incorrect and misleading. His task is, therefore, very difficult, especially when many of the poisons except corrosives and irritants do not show any characteristic post-mortem signs and when bodies are in an advanced state of decomposition.....

Similarly, Gonzales' *Legal Medicine and Toxicology*' states at p. 629:

The question of whether or not a negative toxicological examination is consistent with death by poison can be answered affirmatively, as many persons overcome by carbon monoxide

die after twenty-four hours, at which time the gas cannot be determined in the blood by chemical tests. Likewise, the organs of individuals who have been poisoned by phosphorus may not contain the toxic substance responsible for the death if they have managed to survive its effects for several days.

Many conditions seriously interfere with the toxicological examination, such as post-mortem decomposition.....

We need not multiply authorities, because every book on toxicology begins with a statement of such a fact. Of course, there is a chemical test for almost every poison, but it is impossible to expect a search for every poison. Even in chemical analysis, the chemical analyser may be unsuccessful for various reasons. Taylor in his "*Principles and Practice of Medical Jurisprudence*" (Vol. II, p. 228), gives three possible explanations for negative findings, *viz*., (1) the case may have been of disease only; (2) the poison may have been eliminated by vomiting or other means or neutralized or metabolized; and (3) the analysis may have been faultily performed.

Svensson and Wendel in "*Crime Detection*" have stated at p. 281 that:

Hypnotics are decomposed and disappear very quickly some even in the time which elapses between the administration and the occurrence of death.

Circumstantial evidence in this context means a combination of facts creating a network through which there is no escape for the accused, because the facts taken as a whole do not admit of any inference but his guilt. To rely upon the findings of the medical man who conducted the post-mortem and of the chemical analyser as decisive of the matter is to render the other evidence entirely fruitless. While the circumstances often speak with unerring certainty the autopsy and the chemical analysis taken by themselves may be most misleading. No doubt, due weight must be given to the negative findings at such examinations. But, bearing in mind the difficult task which the man of medicine performs and the limitations under which he works, his failure should not be taken as the end of the case, for on good and probative circumstances, an irresistible inference of guilt can be drawn.

In the present case, the effort of the appellant has been to persuade the court that the death of Laxmibai was possibly the result of disease rather than by poison. During the course of the case and the appeal, various theories have been advanced and conflicting diagnoses have been mooted. The case of the appellant has wavered between death by diabetic coma and by hypoglycemia, though relying upon the condition of the arteries and the aorta and the rigidity of the neck, suggestions of coronary complications and renal failure have also been made. We have shown above that this was not a case of diabetic coma because of the absence of the cardinal symptoms of diabetic coma. This also is the opinion of Dr. Variava and Dr. Mehta, though Dr. Jhala, for reasons which we have indicated, accepted it.

The appellant argued again the case from the angle of diabetic coma, but later veered in favour of hypoglycemia. This change is noticeable not only in the arguments before us but also throughout the conduct of the case is merely to confuse the issue, and create, if possible a doubt, which would take the mind away from the surrounding circumstances and focus it only upon the medical aspect of the case. Full advantage has been taken of the findings of Dr. Ugale and Dr. Miss Aneeja, which suggest partly an onset of diabetic coma, partly of hypoglycemia and partly of renal failure. There is no true picture of any one disease. The rigidity of the neck was not reflected in the chemical analysis of the cerebro-spinal fluid and was negatived, in so far as renal failure is concerned, by the negative findings about albumen. Diabetic coma stood ruled out by the presence of the Babinsky sign and the suddenness of the onset, the negative aspect of acetone and the rather remarkable failure of the specific treatment given for it to have worked any change. Driven from these considerations to such doubtful suggestions as coronary complications of which no physical evidence was found by Dr. Jhala, the appellant put his case on hypoglycemia, and relied upon the fact that at the hospital 40 units of insulin intravenously and another 40 units subcutaneously were administered. Medical text-books were quoted to show that in the case of the hypoglycemic coma the introduction of even a small quantity of insulin sometimes proves fatal. The learned advocate general stoutly resisted this move, which was at variance with the

case as set out before the High Court, because it is obvious enough that if one accepted the theory of hypoglycemic coma, the only injections of insulin causing such shock would be proved to have been given at the hospital and not by the appellant. Here, the position, however, is not so difficult for the state, because Laxmibai was found to have 4 oz. of pasty meal in her stomach, and with food inside her, the possibility of hypoglycemia taking place naturally was extremely remote. If it was hypoglycemic coma due to excessive administration of insulin, then it must have been administered prior to its onset, and who could have given it but the appellant? Even though coma supervenes suddenly, the patient passes through symptoms of discomfort, and Laxmibai would have told the appellant about it in the train. The appellant mentioned nothing of this to Dr. Ugale. If an excessive dose of insulin was given by the appellant, the question of intent would arise, and the conduct shows the intention. There were no pronounced symptoms of hypoglycemia either. Laxmibai just passed from unconsciousness to death without the manifestation of any of the signs associated with the syndrome of hypoglycemic death. It is also to be remembered that hypoglycemic coma is generally overcome by the administration of a very small quantity of glucose 5 or 10 grams of glucose orally: Treatment of Diabetes Mellitus by Joslin, Root and White, p. 350). The 40 units given intravenously were mixed with 20 c.c. of glucose and carried the palliative with them. Even otherwise, Laxmibai was receiving glucose by intragastric drip, and during the three and a half hours there should have been an improvement. The surprising part is that the administration of the insulin and glucose brought about no visible symptoms in the patient either for better or for worse. She passed into death, and the inference can only be that she did not die of these diseases of which she was either suspected or for which she was treated but of something else, which could not answer to the treatment given to her.

Dreisbach in his Handbook on Poisons at page 27 has stated that coma also results from the action of several poisons. Depressants, sedatives and hypnotics all cause death by coma (ibid, p. 201). The symptoms, according to the author, are sleepiness, mental confusion, unsteadiness rapidly followed by coma with slow, shallow respiration, flaccid muscles and absent deep reflexes. The difference between coma due to disease and coma as the result of poisons is stated by him in the following words:

> *Coma from poisoning presumably results from some interference with brain cell metabolism. In attempting to combat the effects of drugs which induce coma, remember that no agents are known which will specifically overcome the metabolic derangements of drug-induced coma. The mechanism of action of cerebral stimulant drugs is also unknown, but these drugs presumably act by depressing some inhibiting function in the cell. There is no evidence that any stimulants specifically oppose the cellular metabolic depression induced by depressant drugs such as the barbiturates.*

No specific antidote is known for the sedative and hypnotic drugs (ibid., p. 202).

The condition of Laxmibai clearly indicated an impairment of the central nervous system. It is no doubt true that in some cases of coronary thrombosis, coma supervenes; but it is idle to suggest in the present case that Laxmibai was afflicted by this type of coma, because Dr. Jhala who performed the post-mortem examination and opened the coronary arteries found no evidence of thrombosis. According to Otto Saphir, a myocardial infarct is easily detected (Autopsy, p. 301-302). Coma in Laxmibai's case, as we have shown above, was not the result of acidosis, hypoglycemia, renal failure or meningeal irritation. Her liver, pancreas and kidneys were found to have no pathological lesions and it is significant that no question was even attempted to establish that the opinion of Dr. Jhala on this part of the case was incorrect. Learned counsel for the appellant suggested that the examination by Dr. Jhala might have been superficial, and might not have included a microscopical examination of sections of some of the vital organs normally affected by diabetes. This suggestion, in our opinion ought to have been put forward during the cross-examination of the witness, and it is unfair now to suggest that the opinion that no lesions were found was based on either improper or inadequate examination. We hold that Dr. Jhala performed the examination adequately, and he was also helped by his assistants.

Here, we pause to ask a question of why the appellant brought up the question of hysterical fits at all. He could have said that Laxmibai was a diabetic, and that it was likely she had coma by reasons of that disease. The suggested diagnosis given by the appellant was so unlikely that Dr. Ugale questioned it then and there. There is nothing in the Wanlesswadi T.B. Sanatorium

papers or in Dr. Sathe's evidence to show that Laxmibai had hysterical fit after her hysterectomy operation. No suggestion was made to the doctors in court that Laxmibai might have had hysterical fits. The condition of the muscles and the absence of deep reflexes clearly show that this was just another piece the appellant gave the full particulars to Dr. Miss Aneeja. No suggestion was made to her or to Dr. Ugale that any information other than what was noted in the case papers was furnished. There is no case for holding that Laxmibai had a relapse of hysterical fits.

It would, therefore, appear that Laxmibai's condition was not due to any disease, because diseases inducing coma generally leave some trace behind, and also respond to medication. No doubt, in some cases the pathological findings after death from diabetic coma have been negative, but the question is, if this was such a case. We have, on the one hand, the fact that numerous poisons causing coma leave no identifiable trace in the victim after death, and, on the other, that sometimes the autopsy does not disclose any discoverable signs in a patient who dies after an attack of diabetic coma or disease. The appellant can be presumed to have had knowledge of these poisons. The appellant challenged the Advocate General to show from any standard book that the symptoms found by the doctors accorded with any known poison. Here, it must also be remembered that a man with knowledge may manipulate not one but more drugs to achieve his purpose, and the cardinal signs of poisoning on the victim may, as a result, be either obliterated or, at least significantly modified.

We give one example on which a certain amount of knowledge is possessed even by laymen. A poison of which one of the symptoms would be the contracting of the pupils of the eyes may be side-tracked by putting into the eyes of the victim a drug like atropine, which by its local action dilates the pupils. We give this example, because most of us know the action of atropine on the eyes, and because the knowledge may confuse the symptoms by a simple trick. We are not suggesting that this is what has happened in this case; but when we have to deal with a case of crime versus natural death, we cannot overlook the possibility of some ingenious artifice having been used to screen the action.

If Laxmibai died in circumstances which prima facie admit of either disease or homicide by poisoning, we must look at the conduct of the appellant who brought her to the hospital, and consider to what conclusion that conduct unerringly points. If the appellant as an honest medical man had taken Laxmibai to the hospital and she had died by reason of disease, his conduct would have been entirely different. He would not have taken her to the hospital bereft of property with which she started from home; he would not have given a wrong history of her ailments; he would not have written a letter suggesting that she had a brother in Calcutta, which brother did not exist, he would not have abandoned the corpse to be dealt with by the hospital as an unclaimed body, he would not have attempted to convince the world that she was alive and happily married; he would not have obtained her property by forgeries, impersonation and other tricks indulged in both before and after her death; but he would have informed her relatives and done everything in his power to see that she was properly treated and stayed on to face whatever inquiry the hospital wished to make into the cause of death and not tried to avoid the post-mortem examination and would not have disappeared, never to reappear. His prevarications about where Laxmibai was, make a big and much varied list, and his forgeries cover scores of documents. In the words of Baron Parke in Towell's case.[1]

> *Circumstantial evidence is the only evidence which can in cases of this kind, lead to discovery. There is no way of investigating them except by the use of circumstantial evidence: but it most frequently happens that great crimes committed in secret leave behind them some traces, or are accompanied by some circumstances which lead to the discovery and punishment of the offender.....Direct evidence of persons who saw the fact if that proof is offered upon the testimony of men whose veracity you have no reason to doubt is the best proof: but, on the other hand, it is equally true with regard to circumstantial evidence that the circumstances may often be so clearly proved, so closely connected with it, or leading to one result in conclusion. That the mind may be as well convinced as if it were proved by eye-witnesses.*

The appellant, in this case, took some risk in taking Laxmibai to the hospital and in giving his name there; and these aspects were, in fact, stressed as arguments in the case. As regards the first part, the argument overlooks that what appears to us to be a risk might not have so appeared to the appellant, who might have been sure of his own ability to screen himself. To him, the death of Laxmibai at the hospital without the discovery of poison would be the greatest argument in his favour that he had acted honestly. The second argument is equally unacceptable to us. The appellant could not take the risk of a false name and address if he was intending that the body should be disposed of as unclaimed. By giving his own address he could keep the strings in his own hands. If he gave an address and no reply came from that address, the hospital would suspect foul play. If he gave the address of Laxmibai, people in Poona would know of this mysterious death, and they would remember the death of Purshottam *alias* Arvind in 1954. At that time a post-mortem examination on the body of Arvind was held (*see*, evidence of Ramachandra (P.W. 1), and the explanation of the appellant given in writing on January 22, 1954, is set out below in his own words:

> *My name is Anant Chintaman Lagu, age.....years, residing at No. 431/5, Madiwale Colony, Poona, on being questioned by the state that I am the family doctor of Karve family in H. No. 94/95, Shukrawar. The deceased Purshottam Anant Karve belongs to that family. He came from Bombay to Poona on Saturday, the 16th January, 1954. He had come to me on Sunday the 17th January, 1954, for medicine for weakness. I treated him for 2 days, on 17th and 18th. He had neither told me that there was poisoning in his stomach, nor did I detect any even when I examined and treated him. He became unconscious 5 hours before his death. He was taken to the Sassoon Hospital at 9 P.M. on 18th January, 1954. He was taken to the Sasoon hospital because his disease increased in unconsciousness and also because his mother as also myself and Dr. Joshi were of the same opinion. He died there in about 30 to 45 minutes. The fact that there was deliberate poisoning by somebody, was neither revealed in my examination nor did Purshottam Karve speak to me anything about it during the time I treated him 2 days before. What exactly was the cause of death could not be revealed during my treatment. I do not know if somebody is on bad terms with him. There are rumours about suicide but there is no reason or any circumstance whatsoever for doing so.*

A false address would have started enquiries at the hospital end. Laxmibai's own address would have started speculation in Poona. It was for this reason that the appellant had to choose another place and to trim between fact and fiction so that he might be able to deal with the matter himself. Of course, Laxmibai did have an address of her own which could have been given, and which did not cease to be her address because she had got an attack of coma, from which people are known to recover.

These arguments, however, are of no avail, in view of the appellant's entire conduct now laid bare, which conduct has been proved to our satisfaction to have begun not after the death of Laxmibai but much earlier. This conduct is so knit together to make a network of circumstances pointing only to his guilt. The case is one of extreme cunning and premeditation. The appellant, whose duty it was to care for this unfortunate lady as a friend and as her medical adviser, deliberately set about first to ingratiate himself in her good opinion, and becoming her confidante found out all about her affairs. All this time he was planning to get at her property after taking her life. He did not perpetrate his scheme at Poona, where the death might have brought a host of persons to the hospital. He devised a diabolical scheme of unparalleled cunning and committed an almost perfect murder. But murder though it hath no tongue, speaks out sometimes. His method was his own undoing; because even the long arm of coincidence cannot explain the multitude of circumstances against him, and they destroy the presumption of innocence with which law clothes him. In our judgment, the two courts below were perfectly correct in their conclusion that the death of Laxmibai was the result of the administration of some unrecognized poison or drug which would act as a poison, and that the appellant was the person who administered it. We accordingly confirm the conviction.

37.23 CONTRABAND QUANTITY IN MIXTURES[36]

Author's Summary

It is a landmark judgment on Narcotics. The Amendment of the NDPS Act has drastically changed the punishment pattern. Now it is based on the quantity of the drug recovered. Law specified 3 categories small quantity (5 g), commercial quantity, (250 g) and the intermediate quantities (5-250 g).

The Narcotics are handled in mixtures. There was confusion whether the weight of the mixture or of the drug in the mixture should be considered for punishment. The SC decided in favour of the latter.

Highlights italicised

Relevant Extracts (Verbatim)

The relevant facts of the case are that on 5-3-2001, the Intelligence Officer was informed by an informant that two persons with certain drugs would be arriving by a Tamil Nadu Transport Corporation Bus at Thiruvananthapuram Bus Stand. The Officer along with other persons and the informant went to the bus stand and waited for the bus. At about 9.00 a.m., the two accused alighted from the Tamil Nadu Transport Corporation bus. They were identified by the informant. They were intercepted by the officials. The officials disclosed their identity and the accused were searched. When asked about possession of narcotic drugs, it was admitted by the accused that they were carrying 4 kg. of heroin and they handed over the bag to the Officer. The bag contained two packets wrapped in Tamil newspapers secured with brown adhesive tape in which light grey powder was found. Two samples of 5 gms. each from both the drug packets were packed, sealed and sent for testing to the Laboratory. The accused were arrested, but the second accused escaped while on the way to produce them before the Magistrate. On 26-3-2001, the Customs House Laboratory, Cochin sent a report confirming the samples as answering to the test of crude heroin, a narcotic drug covered under the N.D.P.S. Act. The report further said that the Laboratory was not equipped to conduct a quantitative test. Thus, the samples were sent for quantitative test. On 22-2-2002, a quantitative test was done in the Customs Laboratory, Chennai where the purity was tested and the quantitative test report indicated as follows:

S. No.	Marking on the cover	Lab No.	Wt. of the sample received with plastic cover	Wt. of the remnant received with plastic cover
1.	S1	235	5.6 g	5.0 g Purity 1.4%
2.	S2	236	4.9 g	4.6 g Purity 1.6%

3. The accused-appellant was charged with the offence committed under section 8(c) read with sections 21 and 29 of the N.D.P.S. Act by the Intelligence Officer, Narcotic Control Bureau. The Special Judge for Trial of Cases under the N.D.P.S. Act found that the substance found in possession of the accused was an opium derivative which has been defined under section 2(xvi), and under section 2(xvi)(e) a preparation, containing more than 0.2% of morphine or diacetylmorphine, is an opium derivative; and that since this contraband article contained 1.4% and 1.6% heroin it is an opium derivative, and punishable under section 21 of the N.D.P.S. Act. Since the manufactured drug being carried weighed 4.07 kg., it would come under section 21(c) being a commercial quantity, but since the accused is only a carrier and is not the beneficiary of the transaction, he would not be awarded the maximum sentence and would be awarded the minimum sentence of

36. *E. Micheal Raj v Intelligence Officer, Narcotic Control Bureau*, AIR 2008 SC 1720 : 2008 Cr LJ 2250.

10 years' rigorous imprisonment and a fine of rupees one lakh, in default of payment of fine rigorous imprisonment for one more year. On an appeal being preferred, the High Court found the accused guilty. The High Court said that section 21 of the N.D.P.S. Act when read with section 2(xi) which defines manufactured drug, makes it evident that the packet seized from the appellant is a manufactured drug. The offence can be in respect of the manufactured drug as well as preparation of manufacture drug. Preparation has been defined in section 2(xx). Again, any mixture of narcotic drug with other substances will also come within section 21 of the N.D.P.S. Act, so the rate of purity becomes irrelevant. The purity test does not advance the case of the accused. As per the High Court, it is the whole quantity of mixture which has to be taken into consideration for imposing the punishment under section 21 of the N.D.P.S. Act. The High Court maintained the conviction and sentence awarded by the Special Judge.

4. The only submission made by Shri K.V. Viswanathan, learned counsel for the appellant is confined to the limited issue relating to the sentence of the appellant under section 21 of the N.D.P.S. Act. As per the learned counsel, the conviction and sentence of the appellant are contrary to law because the total quantity of contraband seized from him was 4.07 kg. Since the purity of heroin is 1.4% and 1.6% respectively in two samples, therefore the quantity of heroin in possession is only 60 g. [(1.4+1.6)/2 = 1.5% of 4.07 kg. = 60 gs.). Thus, the total quantity of heroin seized is below 250 g., *i.e.,* below the commercial quantity. It is submitted that it is not the total weight of the substance allegedly recovered that is material, but the percentage content of heroin translated into weight that is relevant.

5. On the other hand, Shri Vikas Sharma, learned counsel appearing for the respondent urged that it is only the weight of the substance found in possession of the appellant and recovered from him ought to be seen, and once the substance tested positive for heroin, its percentage content in the substance was irrelevant, the entire substance would be viewed as a narcotic drug and consequently the total weight of the substance ought to be taken into consideration for determining whether it was a small quantity or a commercial quantity.

6. The provisions of the N.D.P.S. Act were amended by the Narcotic Drugs and Psychotropic Substances (Amendment) Act, 2001 (Act 9 of 2001) (w.e.f 2-10-2001), which rationalised the punishment structure under the N.D.P.S. Act by providing graded sentences linked to the quantity of narcotic drugs or psychotropic substances carried. Thus, by the Amending Act, the sentence structure changed drastically. Small quantity and commercial quantity were defined under section 2(xxiiia) and section 2(viia) respectively. New section 21 also provides for proportionate sentence for possessing small, intermediate and commercial quantities of offending material. As per Entry 56 of the Notification dated 19-10-2001 issued by the Central Government which deals with heroin, small quantity has been mentioned as 5 g. and commercial quantity has been mentioned as 250 g. So, the basic question for decision is whether the contravention involved in this case is small, intermediate or commercial quantity under section 21 of the N.D.P.S. Act, and whether the total weight of the substance is relevant or percentage of heroin content translated into weight is relevant for ascertaining the quantity recovered from the accused.

7. To appreciate the arguments of the parties, the relevant sections of the N.D.P.S. Act have to be looked into, which are as under: section 2(viia) (inserted by Amending Act 9 of 2001 w.e.f. 2-10-2001).

'Commercial quantity', in relation to narcotic drugs and psychotropic substances, means any quantity greater than the quantity specified by the Central Government by notification in the Official Gazette; section 2(xxiiia) (inserted by Amending Act 9 of 2001 w.e.f. 2-10-2001).

'Small quantity', in relation to narcotic drugs and psychotropic substances, means any quantity lesser than the quantity specified by the Central Government by notification in the Official Gazette; section **2(xvi).**

'Opium derivative' means—

(a) **Medicinal opium,** that is, opium which has undergone the processes necessary to adapt it for medicinal use in accordance with the requirements of the Indian Pharmacopoeia or any other Pharmacopoeia notified in this behalf by the Central Government, whether in powder form or granulated or otherwise or mixed with neutral materials;

(b) **Prepared opium,** that is, any product of opium by any series of operations designed to transform opium into an extract suitable for smoking and the dross or other residue remaining after opium is smoked;

(c) **Phenanthrene alkaloids,** namely, morphine, codeine, thebaine and their salts;

(d) **Diacetylmorphine,** that is, the alkaloid also known as diamorphine or heroin and its salts; and

(e) **All preparations** containing more than 0.2 per cent of morphine or containing any diacetylmorphine;

Section 2 (xi)

'Manufactured drug means—(a) All coca derivatives, medicinal cannabis, opium derivatives and poppy straw concentrate;

(b) Any other narcotic substance or preparation which the Central Government may, having regard to the available information as to its nature or to a decision, if any, under any International Convention, by notification in the Official Gazette, declare to be a manufactured drug; but does not include any narcotic substance or preparation which the Central Government may, having regard to the available information as to its nature or to a decision, if any, under any International Convention, by notification in the Official Gazette, declare not to be a manufactured drugs.

Section 21. *Punishment for contravention in relation to manufactured drugs and preparations [substituted by the Amending Act 9 of 2001, w.e.f. 2-10-2001]: Whoever, in contravention of any provision of this Act or any rule or order made or condition of licence granted thereunder, manufactures, possesses, sells, purchases, transports, imports inter-State, exports inter-State or uses any manufactured drug or any preparation containing any manufactured drug shall be punishable,—*

(a) where the contravention involves small quantity, with rigorous imprisonment for a term which may extend to six months, or with fine which may extend to ten thousand rupees, or with both;

(b) where the contravention involves quantity, lesser than commercial quantity but greater than small quantity, with rigorous imprisonment for a term which may extend to ten years, and with fine which may extend to one lakh rupees;

(c) where the contravention involves commercial quantity, with rigorous imprisonment for a term which shall not be less than ten years but which may extend to twenty years and shall also be liable to fine which shall not be less than one lakh rupees but which may extend to two lakh rupees:

Provided that the court may, for reasons to be recorded in the judgment, impose a fine exceeding two lakh rupees.

8. The Statement of Objects and Reasons concerning the Amending Act of 2001 is as follows:

> Narcotic Drugs and Psychotropic Substances Act, 1985 provides deterrent punishment for various offences relating to illicit trafficking in narcotic drugs and psychotropic substances. Most of the offences invite uniform punishment of minimum of ten years' rigorous imprisonment which may extend up to twenty years. While the Act envisages severe punishments for drug traffickers, it envisages reformative approach towards addicts. In view of the general delay in trial it has been found that the addicts prefer not to invoke the provisions of the Act. The strict bail provisions under the Act add to their misery.

Therefore, it is proposed to rationalise the sentence structure so as to ensure that while drug traffickers who traffic in significant quantities of drugs are punished with deterrent sentences, the addicts and those who commit less serious offences are sentenced to less severe punishment. This requires rationalisation of the sentence structure provided under the Act. It is also proposed to restrict the application of strict bail provisions to those offenders who indulge in serious offences.

9. The entry of the Notification under which the substance found in possession of the appellant falls is Entry 56 or Entry 239. The relevant portion of the Notification dated 19-10-2001 issued by the Central Government reads as under:

> S.O. 1055(E), dated 19-10-2001. In exercise of the powers conferred by clauses (viia) and (xxiiia) of section 2 of the Narcotic Drugs and Psychotropic Substances Act, 1985 (61 of 1985) and in supersession of Ministry of Finance, Department of Revenue Notification S.O. 527(E), dated 16th July, 1996, except as respects things done or omitted to be done before such supersession, the Central Government hereby specifies the quantity mentioned in columns 5 and 6 of the Table below, in relation to the narcotic drug and psychotropic substance mentioned in the corresponding entry in columns 2 to 4 of the said Table, as the small quantity and commercial quantity respectively for the purposes of the said clauses of that section.

Sl. No	Name of Narcotic Drug[37]	Small Quantity (in gm)	Commercial Quantity (in g./kg.)
56	Heroin Diacetylmorphine	5	250 g

Any mixture or preparation that of with or without a neutral material, of any of the above drugs.

* Lesser of the small quantity between the quantities given against the respective narcotic drugs or psychotropic substances mentioned above forming part of the mixture.

** Lesser of the commercial quantity between the quantities given against the respective narcotic drugs or psychotropic substances mentioned above forming part of the mixture.

10. The possession of offending substance would be considered an offence punishable under the N.D.P.S. Act, as heroin is an opium derivative as per section 2(xvi)(e) which says that all preparations containing more than 0.2 per cent of morphine or containing any diacetylmorphine is an opium derivative. Further, according to section 2(xi), all opium derivatives fall under the category of manufactured drug.

Thus, we conclude that the offending substance is an opium derivative and hence a manufactured drug, the possession of which is in contravention of the provisions of section 8 of the N.D.P.S. Act which prohibits certain operations to the effect that no person shall produce, manufacture, possess, sell, purchase, transport, warehouse, use, consume, import inter-State, export inter-State, import into India, export from India or tranship any narcotic drug or psychotropic substance.

11. *In the present case, the opium derivative which has been found in possession of the accused-appellant is prohibited under section 8 of the N.D.P.S. Act and thus punishable under section 21 thereof. The question is only with regard to the quantum of punishment.*

12. As a consequence of the Amending Act, the sentence structure underwent a drastic change. The Amending Act for the first time introduced the concept of commercial quantity in relation to narcotic drugs or psychotropic substances by adding clause (viia) in section 2, which defines this term as any quantity greater than a quantity specified by the Central Government by notification in the Official Gazette. Further, the term 'small quantity' is defined in section *2,* clause (xxiiia), as any quantity lesser than the quantity specified by the Central Government by notification in the Official Gazette. Under the

37. Non-proprietary/chemical names.

rationalised sentence structure, the punishment would vary depending upon whether the quantity of offending material is 'small quantity', 'commercial quantity' or something in-between.

13. It appears from the Statement of Objects and Reasons of the Amending Act of 2001 that the intention of the legislature was to rationalize the sentence structure so as to ensure that while drug traffickers who traffic in significant quantities of drugs are punished with deterrent sentence, the addicts and those who commit less serious offences are sentenced to less severe punishment. Under the rationalised sentence structure, the punishment would vary depending upon the quantity of offending material. Thus, we find it difficult to accept the argument advanced on behalf of the respondent that the rate of purity is irrelevant since any preparation which is more than the commercial quantity of 250 gms. and contains 0.2% of heroin or more would be punishable under section 21(c) of the N.D.P.S. Act, because the intention of the legislature as it appears to us is to levy punishment based on the content of the offending drug in the mixture and not on the weight of the mixture as such. This may be tested on the following rationale. Supposing 4 gms. of heroin is recovered from an accused, it would amount to a small quantity, but when the same 4 gms. is mixed with 50 kgs. of the powered sugar, it would be quantified as a commercial quantity. In the mixture of a narcotic drug or a psychotropic substance with one or more neutral substance, the quantity of the neutral substance/s is not to be taken into consideration while determining the small quantity or commercial quantity of a narcotic drug or psychotropic substance. It is only the actual content by weight of the narcotic drug which is relevant for the purposes of determining whether it would constitute small quantity or commercial quantity. The intention of the legislature for the introduction of the amendment as it appears to us is to punish the people who commit less serious offences with less severe punishment and those who commit grave crimes, such as trafficking in significant quantities, with more severe punishment.

14. In the case of *Ouseph* alias *Thankachan v State of Kerala*, (2004) 4 SCC 446, this Court in para 8 has held as under:

> *The question to be considered by us is whether the psychotropic substance was in a small quantity and if so, whether it was intended for personal consumption. The words small quantity have been specified by the Central Government by the notification dated 23-7-1996. Learned counsel for the State has brought to our notice that as per the said notification small quantity has been specified as 1 gram. If so, the quantity recovered from the appellant is far below the limit of small quantity specified in the notification issued by the Central Government. It is admitted that each ampoule contained only 2 ml and each ml contains only .3 mg. This means the total quantity found in the possession of the appellant was only 66 mg. This is less than 1/10th of the limit of small quantity specified under the notification.*

From the aforesaid decision, we find that the Court has taken the quantity of the narcotic drug or psychotropic substance found in the mixture, relevant for the purpose of imposition of punishment.

15. The learned counsel for the respondent placed reliance on the decision of this Court in *Amarsingh Ramjibhai Barot v State of Gujarat*, (2005) 7 SCC 550 : AIR 2005 SC 4248 : 2005 Cr LJ 4521, in support of his contention that the entire material found in possession irrespective of the content of the offending material has to be taken into consideration while imposing the punishment. In *Amarsingh* case (*supra*), two persons, namely, Amarsingh and Danabhai were apprehended. Amarsingh was found carrying a plastic bag which contained a black-coloured liquid substance weighing 920 gms. Similarly, 4.250 kg. of grey-coloured substance was recovered from Danabhai. Samples were sent to the Forensic Science Laboratory (FSL). The FSL report indicated that the sample from Amarsingh was opium as described in the N.D.P.S. Act containing 2.8% anhydride morphine apart from pieces of poppy flowers and the sample relating to Danabhai was reported to be opium as described in the N.D.P.S. Act having 1.2% anhydride morphine and also containing pieces of poppy flowers. Both the accused were charged and tried under sections 15, 17 and 18 read with section 29 of the N.D.P.S. Act. The High Court found that the conviction under sections 17

and 18 read with section 29 of the N.D.P.S. Act was not correct, but convicted Amarsingh under section 21(c) and also under section 21(c) read with section 29 of the N.D.P.S. Act, for individually being in possession of opium and for being jointly, in conspiracy with the other accused. The High Court found the accused possessed of commercial quantity and convicted and sentenced him for 10 years rigorous imprisonment plus fine of Rs. 1 lakh. Being aggrieved, Amarsingh approached this Court. This Court has held in para 14 of the judgment as under:

> *There does not appear to be any acceptable evidence that the black substance found with the appellant was coagulated juice of the opium poppy and any mixture, with or without any neutral material, of the coagulated juice of the opium poppy. FSL has given its opinion that it is opium as described in the N.D.P.S. Act. That is not binding on the court.*

The Court further held that the evidence also does not indicate that the substance recovered from the appellant would fall within the meaning of sub-clauses (a), (b), (c) or (d) of section 2(xvi), but residuary clause (e) would apply and consequently it would amount to opium derivative as all opium derivatives fall within the expression 'manufactured drugs' Thus, the Court arrived at the conclusion that what was recovered from the appellant was manufactured drug and the offence proved against the appellant fell clearly within section 21 of the N.D.P.S. Act for illicit possession of manufactured drug. The Court concluded and held in para 17 as under:

> *In respect of opium derivatives (at S.I. No. 93) in the said notification, 5 grams is specified as small quantity and 250 grams as commercial quantity. The High Court was, therefore, right in finding that the appellant was guilty of unlawful possession of a commercial quantity of a manufactured drug. Consequently, his case would be covered by clause (c) and not clause (a) or (b) of section 21 of the N.D.P.S. Act.*

This Court has, therefore, upheld the imposition of minimum punishment under section 21(c) of 10 years rigorous imprisonment with fine of Rs. 1 lakh.

16. On going through *Amarsingh* case (*supra*), we do not find that the Court was considering the question of mixture of a narcotic drug or psychotropic substance with one or more neutral substance. In fact that was not the issue before the Court. The black-coloured liquid substance was taken as an opium derivative and the FSL report to the effect that it contained 2.8% anhydride morphine was considered only for the purposes of bringing the substance within the sweep of section 2(xvi)(e) as 'opium derivative which requires a minimum 0.2% morphine. The content found of 2.8% anhydride morphine was not at all considered for the purposes of deciding whether the substance recovered was a small or commercial quantity and the Court took into consideration the entire substance as an opium derivative which was not mixed with one or more neutral substance/s.

> ***Thus, Amarsingh case (supra) cannot be taken to be an authority for advancing the proposition made by the learned counsel for the respondent that the entire substance recovered and seized irrespective of the content of the narcotic drug or psychotropic substance in it would be considered for application of section 21 of the N.D.P.S. Act for the purpose of imposition of punishment. We are of the view that when any narcotic drug or psychotropic substance is found mixed with one or more neutral substance/s, for the purpose of imposition of punishment it is the content of the narcotic drug or psychotropic substance which shall be taken into consideration.***

> ***17. In the present case, the narcotic drug which was found in possession of the appellant as per the analyst's report is 60 g. which is more than 5 g., i.e. small quantity, but less than 250 g, i.e., commercial quantity. The quantity of 60 g is lesser than the commercial quantity, but greater than the small quantity and, thus, the appellant would be punishable under section 21(b) of the N.D.P.S. Act. Further, it is evident that the appellant is merely a carrier and is not a kingpin.***

18. In these circumstances, the ends of justice would be sub served if we reduce the sentence of the accused-appellant to 6 years rigorous imprisonment with fine of Rs. 20,000 and in default of payment of fine rigorous imprisonment for six months. We order accordingly.

37.24 IDENTITY OF DISMEMBERED HUMAN BODY PARTS[38]

(DNA, Odontology, Superimposition used)

Author's Summary

It is a shocking inhuman brutal murder of a medical student by a senior medical student. The culprit dismembered the body and disposed off the parts at various places. Parts were recovered at the instance of the culprit. Forensics established that the various body parts belong to the same person. DNA of the parents and body parts established the identity of the deceased as that of their son.

Highlights italicised

Relevant Extracts

4. In the academic year of 1995-96 the respondent-accused was studying in the senior first year course of MBBS and the deceased-Navarasu, son of Dr. P.K. Ponnusamy [PW-1], a retired Vice-Chancellor of Madras University, was studying in the junior first year course of MBBS in Raja Muthiah Medical College, Annamalai University, Annamalai Nagar. The respondent was staying in room No. 319 of KRM Hostel and the deceased was staying in room No. 95 in E.1 Malligai Hostel belonging to the same medical college campus. PW-1 returned from his foreign trip on 7-11-1996 and was waiting for the arrival of his son-Navarasu from college to celebrate Diwali which in that relevant year fell on 10-11-1996. When Navarasu did not return home till 9-11-1996, PW-1 started enquiring from the friends of his son, available at Madras but no information of his whereabouts could be gathered by the father. PW-1 then on 9-11-1996 rang up the university authorities to find out and ascertain the whereabouts of his son. When he was informed that the college authority found his hostel room locked and when it was broken upon, it was found that his belongings along with a small box were lying in the room but he was not available in the room. The college authorities and the father were of the opinion that Navarasu had not left for Diwali to Madras. PW-1 thereafter rushed to the University on 10-11-96 and made a complaint of missing of his son at about 11.30 p.m. on 10-11-96 which was registered as Crime No. 509 of 1996 [Exhibit-P1].

5. While this process was going on and without the knowledge of Annamalai Nagar Police, a torso was recovered at about 8.30 a.m. on 7-11-1996 by G. Boopahty, Inspector of Police, E.5 Pattinapakkam [PW-55], from the PTC Bus Depot at Mandaiveli, Madras based on the information given by Prakash 3[PW-53], conductor of the bus route No. 21G. The said recovered torso was sent for post-mortem after an inquest. The Annamalai Nagar Police after registering the missing report started investigation and during the course of such investigation gathered materials and also received information from various persons including students of the college pointing the guilt towards the accused, who was also found absconding from the college premises from 12-14-11-1996. On 14-11-1996 the accused surrendered himself before the Judicial Magistrate, Mannargudi. The message of his surrender was conveyed to the Annamalai Nagar PS, which got the police custody for five days of the accused from 18.11.1996.

On 19-11-1996 at about 1.30 a.m. the accused gave a confessional statement stating that he has put the severed head of the deceased in the boat-canal within the University campus. Pursuant to the said confession, the head was also recovered. Annamalai Nagar PS on 20-11-1996 asked E5. Pattinapakkam PS for sending the records connected with the torso recovered at Madras on the suspicion that it may belong to the severed head of the deceased-Navarasu, which was recovered at the instance of the accused. Dr. K. Ravindran [PW-66] conducted autopsy/post-mortem of the head at 10.00 a.m. on 21-11-1996. On 22-11-1996 a message was received from Villupuram Control Room which was forwarded to Annamalai Nagar PS which

38. *Inspector of Police, Tamil Nadu v John David,* 2011 AIR SCW 2764.

mentioned that three human bones femur, tibia and fibula have been recovered at 1.30 a.m. on 21-11-1996 from the seashore of Konimedu of Merkanam based on the information given by the concerned Village Administrative Officer-Nagarajan [PW-43]. Post-mortem of the limbs were conducted by Dr. Srinivasan [PW-45] and later limbs were sent to PW-66. PW-66, after examining the severed head, the torso and three human bones above mentioned, found that there are scientific materials to hold that they belong to a single individual and also the fact that they belong to deceased-Navasaru.

The father of the deceased PW-1 and Thandeeswaran [PW-60], nephew of PW-1, also identified and confirmed that the head and torso are of the deceased.

For confirming the said fact, the sample blood of PW-1 and his wife Baby Ponnusamy [mother of Navasaru] was examined by Dr. G.V. Rao [PW-77] at Hyderabad by DNA test. PW-77 compared the tissues taken from the severed head, torso and limbs and on scientific analysis he found that the same gene found in the blood of PW-1 and Baby Ponnusamy were found in the recovered parts of the body and that therefore they should belong to the only missing son of PW-1.

37.25 COURT NO SUPER EXPERT[39] [LANDMARK JUDGMENT]

Author's Summary

This is an unfortunate situation where the trial court substituted his own opinion for that of medico-legal expert. SC depreciated the substitution:

"('court's) *opinion is not only unwarranted but also indicative of lack of appreciation of the evidential value to be attached to expert medical evidence".*

Highlights italicised

Relevant Extracts (verbatim)

The learned-trial Judge in his reasoned judgment has taken the view that there is a fatal flaw in the prosecution case since the medical evidence does not support the case of the prosecution of assault on the deceased by so many persons at the same time in the manner and with the weapons stated. It is pointed out that, P.W. 20 Dr. Sankpal, Medical Officer, Primary Health Centre, Narayangaon who did the post-mortem on the body of deceased stated before the Court that there were in all 26 external injuries on the body of the deceased Namdeo. There were fractures found during the internal examination of the body. The external injuries Nos. 7, 22, 23 and 24 are punctured wounds with lacerated edges and the cause of the death of deceased Namdeo is shock due to rupture of left lung and multiple injuries. The left lung was ruptured apparently due to fractured ribs from 8th to 10th on left side.

The learned trial Judge has noted Dr. Sankpal's opinion that the punctured wounds were caused with hard and blunt object, such as, wooden sticks and iron rods and that Dr. Sankpal has identified the wooden sticks (article No. 44) and iron rod (article No. 42) to be the weapons which could have inflicted the punctured wounds on the body of Namdeo -- and logically.

We are constrained to observe that the learned trial Judge was wrong in substituting the expert opinion of the Medical Officer, by his own and, therefore, his findings to the contrary are unjustified and unwarranted.

Dr. Sankpal, P.W. 20 in his deposition before the Court, in paragraph 6 of his evidence, has opined that Injury Nos. 7, 23 and 25 are punctured wounds with lacerated edges. That these injuries could be caused by the rough end of the iron pipe shown to him. He

39. *Gulam Nurmamad Theim v State of Gujarat,* 2002 Cri LR (SC MAH GUJ) : Guj 757 : 2002 (3) Guj LR 2642 : 2003 Cr LJ 356 (Guj).

has further stated that the said injuries can be caused with the wooden sticks and iron bar shown to him before the Court. Dr. Sankpal further opined that considering the nature and number of injuries the same must have been caused due to several strokes and the injuries are found to have been caused all over the body from head up to toe. *Nothing has been brought in the cross-examination of Dr. Sankpal to discredit his expert opinion that the punctured wounds could have been caused with the wooden sticks and iron rod, namely, articles 44 and 42. In fact, in his cross-examination, Dr. Sankpal has reiterated that the punctured wounds mentioned in column 17 of the notes could have been caused by articles 42 and 44 and in order to inflict such wounds, those articles must have been thrust with sufficient force in the body. That the punctured wound with its rough and lacerated edges could be caused by edges of articles 42 and 44.*

Thus nothing has been brought in the cross-examination to reject the expert opinion of Dr. Sankpal that the punctured wounds were caused by the thrust of wooden sticks and iron rods and that the several injuries on the body of the deceased must have been caused due to several strokes inflicted by the accused with wooden sticks and iron rods. That the puncture wounds were caused by wooden sticks and iron rods and the severe nature of injuries caused by several strokes all over the body from head up to toe of the deceased resulted in the death of Namdeo due to shock and rupture of left lung and multiple injuries have been established beyond doubt.

The conclusion of the learned trial judge based on his personal opinion in the face of expert opinion is not only unwarranted but also indicative of lack of appreciation of the evidential value to be attached of expert medical evidence.

37.26 JUDICIAL ACTIVISM[40]

Author's Summary

It is a case of rape and abduction. The IO failed to do his duty, which is highlighted through italicizing the relevant text s enunciated by the High court and endorsed by the SC. It is fortunate that the activism of the courts saw through the dereliction of duty and convicted the culprit u/s 376 IPC for rape and provided justice to the victim and passed strictures against the errant IO.

Highlights italicised

Relevant Extracts (Verbatim)

29. We now say something about PW-15, S.I. Bagal, who refused, to register an offence and on whom both the trial court and the High Court have commented, and in our view correctly. The trial court in paragraph 34 of the judgment observed as under:

"It is a pathetic situation, when the citizen is confronted with the dishonest police officer. I am constrained to observe that the investigation done by S.I. Bagal P.W. 15, is not only suspicious but also dishonest and out and out in favour of the accused. I am making this observation with responsibility, I have scrutinized carefully the 3 statements recorded by S.I. Bagal, they are very cryptic and favourable to the accused. He did not care to ascertain the correct age of the victim girl, in a kidnapping and rape case. He did not register an offence against the accused. I fail to understand as to what interrogation of the accused he has done. He has obtained the signature on the statement of PW-4 Pushpa and Eknath and right hand thumb impression on the statement of Smt. Vimal for what reason, I do not understand, on three statements. At least he could have registered the offence for kidnapping after taking extract of birth from the school. If he wanted to ascertain the correct date from her father Pandurang and he was aware that PW-1 Pandurang was in K.E.M. Hospital and he wanted to obtain Hospital record, but he never cared to visit K.E.M. Hospital and to record the statement of Pandurang. He was trying to shift the burden

40. *Vishnu v State of Maharashtra,* AIR 2006 SC 508 : 2005 AIR SCW 6149 :2006 Cr LJ 303 (SC).

on the Senior P.I. Sharma. Merely, he had produced these three statements in a routine manner before P.I. Sharma, on the next day. There is no guarantee that he had faithfully recorded statements of all these three witnesses. The reading of the three statements clearly indicates that those are completely in favour of the accused. The entire conduct of S.I. Bagal in the investigation has a smell of suspicion and dishonesty."

The High Court also observed about the conduct of PW-15, S.I. Bagal as under:

"In the present case, the investigation conducted by S.I. Bagal was completely defective and casual. He has not even registered the offence. The learned trial Judge has observed that the attitude of S.I. Bagal was completely dishonest and partial to the accused. On closer scrutiny of the record, we are inclined to agree with the observations of the learned Judge. We have reason to believe that S.I. Bagal deliberately refused to register the offence in order to help the accused at the costs of the prosecutrix. But despite this deficiency, the prosecution has successfully provided the offence of rape. We have, therefore, no hesitation in confirming the conviction recorded by the trial court under section 376 of the IPC."

30. In the facts and circumstances of this case, the comments made by the trial court and the High Court about the manner in which S.I. Bagal conducted the first investigation are well justified.

37.27 STRICTURES ON PRIOR REPORTS[41]

Author's Summary

It is a straightforward case of forgery. A bank employee got a cheque book issued in the name of a customer and withdrew through cheques over a lakh of rupees. The customer reported the fraud. The bank management found the culprit, proved his depredation through a handwriting expert and dismissed him after holding an inquiry.

In defence the forger said that the report of the expert cannot be used as his expertise is tainted due to strictures. The SC held that prior strictures do not prevent acceptance of reliable evidence.

Highlights italicised

Relevant Extracts (Verbatim)

Order of dismissal from service having been restored by Division Bench of Delhi High Court setting aside the judgment of the learned Single Judge, this appeal has been filed.

Factual background filtering out unnecessary details is as follows:

Appellant (hereinafter referred to as 'the employee') joined services of the Lakshmi Commercial Bank in 1976 as a Clerk. The said bank was merged with Canara Bank (hereinafter referred to as 'the employer') in October, 1985. As a consequence, services of the employee stood transferred to the employer-Bank. He was posted as a Clerk in Deen Dayal Upadhyay Marg, New Delhi Branch and was deputed to work at AIWC extension of the said branch.

One customer of the Bank *i.e.,* S.V. Deshpande, advocate lodged a complaint with the police stating that there has been unauthorized withdrawal of Rs. 1.07 lakhs from his account in the Bank. An internal investigation was also undertaken by the employer in respect of the complaint. Report of the preliminary investigation was submitted and the employee was served with charge-sheet along with imputations of misconduct to the effect that the employee was responsible for the unauthorised withdrawal from the customer's account.

41. *Lalit Popli v Canara Bank,* AIR 2003 SC 1796 : 2003 AIR SCW 1238 : (2003) 3 SCC 583.

Enquiry Officer was appointed to hold the enquiry and along with other witnesses the evidence of Handwriting Expert Mr. V.K. Sakhuja was tendered. The proceedings in the enquiry were concluded on 29-4-1993. Both the parties were asked to submit their written submissions. At this stage the employee filed an application for further cross-examination of an Handwriting Expert. Said prayer was rejected on 10th May, 1993. The Enquiry Officer submitted his report and the employee was also furnished with a copy to make his submissions as regards the findings. The written submissions were submitted on 24th June, 1995. Findings of the Enquiry Officer were recorded. Thereafter order of dismissal was passed.

The Disciplinary Authority concurred with findings of the Enquiry Officer after taking into account the submissions made by the employee. The charge sheet contained the following allegations:

> "On the 11th of May, 1992, a charge-sheet was issued to the petitioner in the following terms:—
>
> Whereas, there are *prima facie* grounds for believing that you have committed gross misconduct, the particulars whereof are given below, this charge-sheet has been drawn up against you and you are required to submit me within 15 days of receipt of this charge-sheet a statement in writing setting forth your defence, if any and showing cause as to why suitable action should not be taken against you.

CHARGE:

You have been working at Canara Bank, DDU Marg, New Delhi Branch since 7-3-1986.

One Mr. S.V. Deshpande, Advocate, Supreme Court of India is maintaining his SB A/c. No. 4272 with AIWC Extn. Counter of DDU Marg, New Delhi Branch. On 23-12-1991 a cheque book authorized to be issued in S.B. A/c. No. 4272 to one Sri Mohinder Kumar on the strength of a purported letter in violation of the laid down procedure of the bank. Thereafter, a total of Rs. 1,07,000 was withdrawn from his account by utilising five cheques out of the abovesaid cheque book, details which are given below:

Date	Cheque No.	Amount
26-12-91	460827	Rs. 15,000
28-12-91	460823	Rs. 15,000
31-12-91	460821	Rs. 15,000
31-12-91	460822	Rs. 14,000
31-12-91	460826	Rs. 50,000

The account-holder has complained/disputed above said withdrawals as well as issuance of the cheque book No. 460821 to 460830. The purported letter on the basis of which the abovesaid cheque book had been issued had also not been found on records. The handwriting expert has confirmed that the signatures appearing on the abovesaid cheque are not that of Mr. S.V. Deshpande, the account-holder and they are forged.

The cheque No. 460826 for Rs. 50,000 was posted by you in the relative ledger on 31-12-1991 though there was a fictitious endorsement on the reverse of the cheque to give creditability to the transaction.

Handwriting expert has opined after examining your handwriting with that of the disputed instruments in question that the signatures of the account-holder appearing on the above said five cheques and the endorsement on the back of the cheque No. 46026 for Rs. 50,000 is in your handwriting.

From the above, it is evident that you by misusing your official position, in collusion with someone else, got the above said cheque book issued in S.B. A/c. No. 4272, utilised

the cheque leaves in question by forging the signature of the account-holder and got the same presented to encash the cheques fraudulently.

By your above said fraudulent acts you have caused damage to the property of the bank thereby committed a gross misconduct within the meaning of Chapter XI, regulation 3, clause (j) of Canara Bank Service Code.

Your above said acts are also prejudicial to the interests of the bank thereby you have committed a gross misconduct within the Meaning of Chapter XI, regulation 3, clause (j) of Canara Bank Service Code.

Your abovesaid acts are also prejudicial to the interests of the bank thereby you have committed a gross misconduct within the meaning of the Chapter XI, regulation 3, clause (m) of Canara Bank Service Code.

An appeal was preferred by the employee before the prescribed appellate authority who rejected the appeal. The employee challenged the findings culminating in his order of dismissal by filing a writ petition before the High Court.

The main plea which was advanced before the learned Single Judge was that the Enquiry Officer should not have rested his decision on the opinion of the Handwriting Expert. The entire case rested on suspicion and there was no material to connect him with the alleged misconduct. Learned Single Judge referring to the evidence recorded during the enquiry proceedings came to hold that the conclusions arrived at by the Enquiry Officer were erroneous and no credence should have been attached to the evidence of V.K. Sakhuja and his evidence is no evidence at all. It was also held that the charges framed by the Bank do not have sustainability in law. These observations came to be made by the learned Single Judge because of some adverse remarks made against V.K. Sakhuja in three cases. The conclusions of learned Single Judge in paragraph 17 so far as relevant read as follows:

> *"The fact that the courts had made very strong stricture against the Handwriting Expert is not disputed. In my view, Mr. Sakhuja is not a person who is competent to speak about the handwriting or fingerprints. His evidence is no evidence at all. Consequently, the charge issued by the bank is not sustainable in law. The findings by the Inquiry Officer against the petitioner are not based on any evidence and, thus, the order passed by the disciplinary authority cannot be sustained, in law there is, no evidence against the petitioner. Thus, the order of the disciplinary authority is wholly illegal, and it cannot be sustained."*

In appeal, the Division Bench observed that the High Court in exercise of the power under article 226 of the Constitution of India, 1950 (in short 'the Constitution') does not act as an appellate authority and, therefore, the learned Single Judge was not justified in interfering with the conclusions arrived at by the disciplinary authority. This judgment of the High Court is under challenge.

Learned counsel appearing for the appellant-employee submitted that there has been denial of fair play. There is no material to connect the appellant with alleged forgery, which was the foundation for the disciplinary action. Report of the Handwriting Expert about whose credibility serious remarks were made has no evidentiary value, and he is not a competent witness and his report which forms the foundation for disciplinary action has to be ignored and if that is kept out of consideration, there is no other material on which the allegations of misconduct could be substantiated. It is pointed out that when the investigation was done initially, a report was submitted by the Forensic Science Laboratory which did not find any material against the employee and others. The employee was also denied an adequate opportunity to submit his reply as regards the enquiry report. The charges related to two transactions. One was posting of the cheque and the other related to forgery. Report of the Handwriting Expert is full of inconsistencies and the conclusion about similarity in handwriting in the disputed document and the admitted signatures has been drawn erroneously. To prove his innocence the employee had requested the authorities to hand over the enquiry to the Central Bureau of Investigation. This request was made as the employee was convinced that the authorities were bent upon removing him from service for union activities. Further, request was made for being represented by an advocate which

was turned down. The employee had requested for supply of certain documents which were not accepted to causing thereby prejudice.

Learned counsel for the respondents on the other hand submitted that the Division Bench rightly considered the scope and ambit of judicial review in the matter of disciplinary proceedings. The stand that the Handwriting Expert's report cannot be accepted without further corroboration is not the correct proposition in law. Denial of the representation by an advocate was also justified because the presenting officer was not an advocate or a person with a law background. The only area of dispute related to acceptability of the Handwriting Expert's report. The employee who claimed to be a trade union activist is well-versed with various aspects relating to service jurisprudence, has cross-examined at length and quite effectively the management witnesses. Therefore, there is no substance in the plea that there was prejudice by refusal of permission to be represented by an advocate. It was further submitted that no argument was advanced before the High Court (either before learned Single Judge or the Division Bench) regarding prejudice. It is also pointed out that the employee himself held accepted that he committed careless mistakes, but took the plea that there was no criminal intent. The authorities have analysed the job requirements of the post which the employee held and discussed at great length as to how the requisite care and caution were not exercised. A bare look at the endorsement on the back side of the cheque would have aroused suspicion. The plea that many transactions took place that day is clearly without substance because an employee of the bank is required to be vigilant and any abnormality should have been noticed. The customer was an advocate and he could not have mis-spelt the word 'signature' as appears on the reverse side of the cheque in question in the endorsement. There was an unusual endorsement and withdrawal of Rs. 50,000 by a bearer cheque. The unusual features should have aroused suspicion. That being so, the authorities were justified in drawing adverse remarks. The report of the Handwriting Expert is clear and cogent and has clearly spelt out the areas of similarities in the disputed document and the admitted writings to highlight as to how employee was the author of forgery.

To start with the approach of the learned Single Judge as regards evidence of V.K. Sakhuja is clearly erroneous. Even if there were adverse remarks (which we find related to 1958-59) that did not affect the credibility of his evidence to treat it as totally irrelevant and to be no evidence in the eye of law. What was required was a careful analysis of evidence, if it was brought to the notice of the authorities that his evidence has been doubted in the past. Nothing could be shown to us as to how the report in this particular case suffers from any infirmity. There is no finding recorded by the learned Single Judge to that effect. On that score alone, the Division Bench was justified in upsetting the learned Single Judge's decision.

Sections 45 and 73 of the Indian Evidence Act, 1872 (in short 'The Evidence Act') deal with opinion of experts and comparison of signature, writing or seal with others admitted or proved. Section 45 itself provides that the opinions are relevant facts. It is a general rule that the opinion of witnesses possessing peculiar skill is admissible. There was no challenge to the expertise of V.K. Sakhuja. He deposed to have testified in about ten thousand cases relating to disputed documents. Though the employee highlighted certain adverse remarks, it cannot be lost sight of that they were about four decades back. But we need not go into that aspect in detail as no infirmity in the report acted upon by the authority in the present case was noticed or could be pointed out.

It is to be noted that under sections 45 and 47 of the Evidence Act, the court has to take a view on the opinion of others, whereas under section 73 of the said Act, the court by its own comparison of writings can form its opinion. Evidence of the identity of handwriting is dealt with in three sections of the Evidence Act. They are sections 45, 47 and 73. Both under sections 45 and 47 the evidence is an opinion. In the former case it is by a scientific comparison and in the latter on the basis of familiarity resulting from frequent observations and experiences. In both the cases, the court is required to satisfy itself by such means as are open to conclude that the opinion may be acted upon. Irrespective of an opinion of the Handwriting Expert, the court can compare the admitted writing with disputed writing and come to its own independent conclusion. Such exercise of comparison is permissible

under section 73 of the Evidence Act. Ordinarily, sections 45 and 73 are complementary to each other. Evidence of Handwriting Expert need not be invariably corroborated. It is for the court to decide whether to accept such an uncorroborated evidence or not. It is clear that even when experts' evidence is not there, court has the power to compare the writings and decide the matter. [See *Murarilal v State of Madhya Pradesh,* (1980) 1 SCC 704 : AIR 1980 SC 531 : 1980 Cr LJ 396 : (1980) 2 SCR 249.]

In the instant case, the Enquiry Officer and the Disciplinary Authority took pains to carefully consider the Handwriting Expert's report and also looked at the documents to arrive at their own conclusions.

Great emphasis was laid on the Forensic Science Laboratory's report to say that the Handwriting Expert's report is not worthy of acceptance. We have looked at the report of the Forensic Science Laboratory. It only says that no definite opinion can be formed. That itself is an indication that a clean chit was not given as claimed by the employee.

It is fairly well-settled that the approach and objective in criminal proceedings and the disciplinary proceedings are altogether distinct and different. In the disciplinary proceedings the preliminary question is whether the employee is guilty of such conduct as would merit action against him whereas in criminal proceedings the question is whether the offences registered against him are established and if established what sentence should be imposed upon him. The standard of proof, the mode of enquiry and the rules governing the enquiry and trial are conceptually different.

See *State of Rajasthan v B.K. Meena,* (1996) 6 SCC 417 : 1996 AIR SCW 4160 : AIR 1997 SC 13 : 1996 (3) SCJ 582. In case of disciplinary enquiry the technical rules of evidence have no application. The doctrine of "proof beyond doubt" has no application. The preponderance of probabilities and some material or record are necessary to arrive at the conclusion whether or not the delinquent has committed misconduct.

While exercising jurisdiction under article 226 of the Constitution the High Court does not act as an appellate authority. Its jurisdiction is circumscribed by limits of judicial review to correct errors of law or procedural errors leading to manifest injustice or violation of principles of natural justice. Judicial review is not akin to adjudication of the case on merits as an Appellate Authority.

In *B.C. Chaturvedi v Union of India,* (1995) 6 SCC 749 : AIR 1996 SC 484 : 1995 AIR SCW 4374 : JT 1995 (8) SC 65, the scope of judicial review was indicated by stating that review by the court is of decision-making process and where the findings of the disciplinary authority are based on some evidence, the court or the Tribunal cannot re-appreciate the evidence and substitute its own finding.

As observed in *R.S. Saini v State of Punjab,* (1999) 8 SCC 90 : AIR 1999 SC 3579 : 1999 AIR SCW 3587 : (1999) 5 SCALE 427 in paragraphs 16 and 17 the scope of interference is rather limited and has to be exercised within the circumscribed limits. It was noted as follows:

> Before adverting to the first contention of the appellant regarding want of material to establish the charge, and of non-application of mind, we will have to bear in mind the rule that the court while exercising writ jurisdiction will not reverse a finding of the enduring authority on the ground that the evidence adduced before it is insufficient. If there is some evidence to reasonably support the conclusion of the inquiring authority, it is not the function of the court to review the evidence and to arrive at its own independent finding. The inquiring authority is the sole judge of the fact so long as there is some legal evidence to substantiate the finding and the adequacy or reliability of the evidence is not a matter which can be permitted to be canvassed before the court in writ proceedings.

A narration of the charges and the reasons of the inquiring authority for accepting the charges, as seen from the records, shows that the inquiring has based its conclusions on materials available on record after considering the defence put forth by the appellant and these decisions, in our opinion, have taken in a reasonable manner and objectively. The conclusion arrived at by the inquiring authority cannot be termed as either being

perverse or not based on any material nor is it a case where there has been any non-application of mind on the part of the inquiring authority. Likewise the High Court has looked into the material based on which the enquiry officer has come to the conclusion, within the limited scope available to it under article 226 of the Constitution and we do not find any fault with the finding of the High Court in this regard."

As noted above, the employee accepted that there was some lapse on his part but he pleaded lack of criminal intent. A bank employee deals with public money. The nature of his work demands vigilance with the inbuilt requirement to act carefully. Any carelessness invites action.

As has been rightly submitted by learned counsel for the respondents-Bank, even to the naked eye the mistake in spelling of "signature" are visible and should not have escaped the eyes of a bank employee who is supposed to be trained and equipped to notice the similarities highlighted by the Handwriting expert in the disputed document and the admitted signatures of the employee to show how the similarly is visible and even any layman can notice the similarity. These were a factual conclusion.

Considering the limited scope of judicial review, the Division Bench was right in upholding the order of dismissal by setting aside the learned Single Judge's order by which interference was made with it. We find no reason to differ from the conclusion of the Division Bench. The appeal is without merit and is dismissed accordingly.

37.28 NOETIC SCIENCES: EMERGING FORENSICS[42]

Author's Summary

This is an unfortunate negative landmark SC judgment on noetic sciences, namely, *polygraph/ /narco-analysis/the Brain Electrical Activation Profile (BEAP)* tests. It disallowed their effective use as evidence in courts but allowed their use in investigation only, subject to the consent of the accused.

The ruling, thereby, tacitly allowed the investigators to use their traditional III Degree modes in interrogation. It, thus, promote inhuman treatment of the suspect under interrogation.

The SC has ruled that for voluntary use of these scientific tests, the guideline provided by the Human Right Commission must be followed scrupulously.

Highlights italicised

Relevant Extracts (Verbatim)

1. The legal questions in this batch of criminal appeals relate to the involuntary administration of certain scientific techniques, namely ***narcoanalysis, polygraph examination and the Brain Electrical Activation Profile (BEAP)*** test for the purpose of improving investigation efforts in criminal cases. This issue has received considerable attention since it involves tensions between the desirability of efficient investigation and the preservation of individual liberties. Ordinarily the judicial task is that of evaluating the rival contentions in order to arrive at a sound conclusion. However, the present case is not an ordinary dispute between private parties. It raises pertinent questions about the meaning and scope of fundamental rights which are available to all citizens. Therefore, we must examine the implications of permitting the use of the impugned techniques in a variety of settings.

2. Objections have been raised in respect of instances where individuals who are the accused, suspects or witnesses in an investigation have been subjected to these tests without

42. *Smt. Selvi v State of Karnataka*, AIR 2010 SC 1974.

their consent. Such measures have been defended by citing the importance of extracting information which could help the investigating agencies to prevent criminal activities in the future as well as in circumstances where it is difficult to gather evidence through ordinary means. In some of the impugned judgments, reliance has been placed on certain provisions of the Code of Criminal Procedure, 1973 and the Indian Evidence Act, 1872 to refer back to the responsibilities placed on citizens to fully co-operate with investigation agencies. It has also been urged that administering these techniques does not cause any bodily harm and that the extracted information will be used only for strengthening investigation efforts and will not be admitted as evidence during the trial stage. The assertion is that improvements in fact-finding during the investigation stage will consequently help to increase the rate of prosecution as well as the rate of acquittal. Yet another line of reasoning is that these scientific techniques are a softer alternative to the regrettable and allegedly widespread use of 'third degree methods' by investigators.

3. *The involuntary administration of the impugned techniques prompts questions about the protective scope of the 'right against self-incrimination' which finds place in Article 20(3) of our Constitution. In one of the impugned judgments, it has been held that the information extracted through methods such as 'polygraph examination' and the 'Brain Electrical Activation Profile (BEAP) test' cannot be equated with 'testimonial compulsion' because the test subject is not required to give verbal answers, thereby falling outside the protective scope of Article 20(3). It was further ruled that the verbal revelations made during a narcoanalysis test do not attract the bar of article 20(3) since the inculpatory or exculpatory nature of these revelations is not known at the time of conducting the test.*

To address these questions among others, it is necessary to inquire into the historical origins and rationale behind the 'right against self-incrimination'. The principal questions are whether this right extends to the investigation stage and whether the test results are of a 'testimonial' character, thereby attracting the protection of article 20(3). Furthermore, we must examine whether relying on the test results or materials discovered with the help of the same creates a reasonable likelihood of incrimination for the test subject.

4. We must also deal with arguments invoking the guarantee of 'substantive due process' which is part and parcel of the idea of 'personal liberty' protected by article 21 of the Constitution. The first question in this regard is whether the provisions in the Code of Criminal Procedure, 1973 that provide for 'medical examination' during the course of an investigation can be read expansively to include the impugned techniques, even though the latter are not explicitly enumerated. To answer this question, it will be necessary to discuss the principles governing the interpretation of statutes in light of scientific advancements. Questions have also been raised with respect to the professional ethics of medical personnel involved in the administration of these techniques. Furthermore, article 21 has been judicially expanded to include a 'right against cruel, inhuman or degrading treatment', which requires us to determine whether the involuntary administration of the impugned techniques violates this right whose scope corresponds with evolving international human rights norms. We must also consider contentions that have invoked the test subject's 'right to privacy', both in a physical and mental sense.

5. The scientific validity of the impugned techniques has been questioned and it is argued that their results are not entirely reliable. For instance, the narco-analysis technique involves the intravenous administration of sodium pentothal, a drug which lowers inhibitions on part of the subject and induces the person to talk freely. However, empirical studies suggest that the drug-induced revelations need not necessarily be true. Polygraph examination and the BEAP test are methods which serve the respective purposes of lie-detection and gauging the subject's familiarity with information related to the crime.

These techniques are essentially confirmatory in nature, wherein inferences are drawn from the physiological responses of the subject. However, the reliability of these methods has been repeatedly questioned in empirical studies.

In the context of criminal cases, the reliability of scientific evidence bears a causal link with several dimensions of the right to a fair trial such as the requisite standard of proving guilt beyond reasonable doubt.

* * * * *

7. At this stage, it will be useful to frame the questions of law and outline the relevant sub-questions in the following manner:

I. Whether the involuntary administration of the impugned techniques violates the 'right against self-incrimination' enumerated in article 20(3) of the Constitution?

I-A. Whether the investigative use of the impugned techniques creates a likelihood of incrimination for the subject?

I-B. Whether the results derived from the impugned techniques amount to 'testimonial compulsion' thereby attracting the bar of article 20(3)?

II. Whether the involuntary administration of the impugned techniques is a reasonable restriction on 'personal liberty' as understood in the context of article 21 of the Constitution?

It was unanimously held that the 'general acceptance' standard articulated in Frye (supra.) had since been displaced by the enactment of the Federal Rules of Evidence in 1975, wherein rule 702 governed the admissibility of expert opinion testimony that was based on scientific findings. This rule provided that:

> *If scientific, technical, or other specialised knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.*

23. It was held that the trial court should have evaluated the scientific evidence as per rule 702 of the Federal Rules of Evidence which mandates an inquiry into the relevance as well as the reliability of the scientific technique in question. The majority opinion (Blackmun, J.) noted that the trial judge's step should be a preliminary assessment of whether the testimony's underlying reasoning or methodology is scientifically valid and whether it can be properly applied to the facts in issue. Several other considerations will be applicable, such as:

1. whether the theory or technique in question can be and has been tested
2. whether it has been subjected to peer review and publication
3. its known or potential error rate
4. the existence and maintenance of standards controlling its operation
5. whether it has attracted widespread acceptance within the scientific community

24. It was further observed that such an inquiry should be a flexible one, and its focus must be solely on principles and methodology, not on the conclusions that they generate. It was reasoned that instead of the wholesale exclusion of scientific evidence on account of the high threshold of proving "general acceptance in the particular field," the same could be admitted and then challenged through conventional methods such as cross-examination, presentation of contrary evidence and careful instructions to juries about the burden of proof. In this regard, the trial judge is expected to perform a 'gate-keeping' role to decide on the admission of expert testimony based on scientific techniques. It should also be kept in mind that Rule 403 of the Federal Rules of Evidence, 1975 empowers a trial judge to exclude any form of evidence if it is found that its probative value will be outweighed by its prejudicial effect.

* * * * *

Conclusion

221. *In our considered opinion, the compulsory administration of the impugned techniques*[43] *violates the 'right against self-incrimination'. This is because the underlying rationale of the*

43. Polygraph Test, Narco-analysis, Brain Electrical Activation Profile.

said right is to ensure the reliability as well as voluntariness of statements that are admitted as evidence. This Court has recognised that the protective scope of article 20(3) extends to the investigative stage in criminal cases and when read with section 161(2) of the Code of Criminal Procedure, 1973 it protects accused persons, suspects as well as witnesses who are examined during an investigation. The test results cannot be admitted in evidence if they have been obtained through the use of compulsion. Article 20(3) protects an individual's choice between speaking and remaining silent, irrespective of whether the subsequent testimony proves to be inculpatory or exculpatory. Article 20(3) aims to prevent the forcible 'conveyance of personal knowledge that is relevant to the facts in issue'. The results obtained from each of the impugned tests bear a 'testimonial' character and they cannot be categorized as material evidence.

222. We are also of the view that forcing an individual to undergo any of the impugned techniques violates the standard of 'substantive due process' which is required for restraining personal liberty. Such a violation will occur irrespective of whether these techniques are forcibly administered during the course of an investigation or for any other purpose since the test results could also expose a person to adverse consequences of a non-penal nature. The impugned techniques cannot be read into the statutory provisions which enable medical examination during investigation in criminal cases, *i.e.,* the *Explanation* to sections 53, 53A and 54 of the Code of Criminal Procedure, 1973. Such an expansive interpretation is not feasible in light of the rule of '*ejusdem generis*' and the considerations which govern the interpretation of statutes in relation to scientific advancements.

We have also elaborated how the compulsory administration of any of these techniques is an unjustified intrusion into the mental privacy of an individual. It would also amount to 'cruel, inhuman or degrading treatment' with regard to the language of evolving international human rights norms. Furthermore, placing reliance on the results gathered from these techniques comes into conflict with the "right to fair trial". Invocations of a compelling public interest cannot justify the dilution of constitutional rights such as the 'right against self-incrimination'.

223. In light of these conclusions, we hold that no individual should be forcibly subjected to any of the techniques in question, whether in the context of investigation in criminal cases or otherwise. Doing so would amount to an unwarranted intrusion into personal liberty. However, we do leave room for the voluntary administration of the impugned techniques in the context of criminal justice, provided that certain safeguards are in place. Even when the subject has given consent to undergo any of these tests, the test results by themselves cannot be admitted as evidence because the subject does not exercise conscious control over the responses during the administration of the test. However, any information or material that is subsequently discovered with the help of voluntary administered test results can be admitted, in accordance with section 27 of the Evidence Act, 1872.

The National Human Rights Commission had published 'Guidelines for the Administration of Polygraph Test (Lie Detector Test) on an Accused' in 2000. These guidelines should be strictly adhered to and similar safeguards should be adopted for conducting the 'Narcoanalysis technique' and the 'Brain Electrical Activation Profile' test.

The text of these guidelines has been reproduced below:

(i) No Lie Detector Tests should be administered except on the basis of the consent of the accused. An option should be given to the accused whether he wishes to avail such test.

(ii) If the accused volunteers for a Lie Detector Test, he should be given access to a lawyer and the physical, emotional and legal implication of such a test should be explained to him by the police and his lawyer.

(iii) The consent should be recorded before a Judicial Magistrate.

(iv) During the hearing before the Magistrate, the person alleged to have agreed should be duly represented by a lawyer.

(v) At the hearing, the person in question should also be told in clear terms that the statement that is made shall not be a "confessional" statement to the Magistrate but will have the status of a statement made to the police.

(vi) The Magistrate shall consider all factors relating to the detention including the length of detention and the nature of the interrogation.

(vii) The actual recording of the Lie Detector Test shall be done by an independent agency (such as a hospital) and conducted in the presence of a lawyer.

(viii) A full medical and factual narration of the manner of the information received must be taken on record.

37.29 BRAIN MAPPING[44]

Author's Summary

A.K. Telgi, a master forger, committed forgery and fraud on an unprecedented scale. He looted thousands of crores of rupees by producing and selling fake stamp paper. He was convicted for the crime; though the SC did not accept the new type of evidence (brain printing) produced by the prosecution dubbing it was vague and not well established.

Highlights italicised

Relevant Extracts (Verbatim)

III. According to the prosecution, following circumstance could not be explained by the applicant.

(a) The fact that he had closed door meeting with A.K. Telgi in isolation between himself and A.K.L. Telgi only to the exclusion of other high ranking officers (Statement of ACP Supriya Patil at Page No. 11912. DCP (HQ) Koregaonkar at Page No. 11898 and DCP Jay Jadhav at Page No. 111940).

(b) The applicant knew A.K.L. Telgi even when he was at Mumbai earlier is also apparent from the statement of DCP Vasant Koregaonkar (Page No. 11898).

(c) Brain Maping (P. 300) of AKL Telgi, shows that he had given positive responses to the question relating to payment made to the applicant, favour shown by the applicant in Pune cases and facilities provided in Mumbai custody by the applicant (Page No. 12960 to 12963)."

13. The plea taken by the Appellant herein about his innocence was rejected by the High Court.

87. *Apart from the fact that nothing has been brought on record to show as to how far a report of brain mapping test can be relied upon, the report appears to be vague. It appears, the Respondents themselves did not want to put much reliance on the said report.*

88. Furthermore, the admissibility of a result of a scientific test will depend upon its authenticity. Whether the brain mapping test is so developed that the report will have a probative value so as to enable a court to place reliance thereupon, is a matter which would require further consideration, if and when the materials in support thereof are placed before the Court.

89. In *Frye v United States,* [293 F 1013 (DC Cir) (1923)], the principles to determine the strength of any investigation to make it admissible were stated in the following terms:

> "Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in the twilight zone the evidential force must be recognized, and while the Courts will go a long way in admitting the expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

90. *Frye* (supra), however, was rendered at a time when the technology, the polygraph test, was in its initial stage and was used in few laboratories. The guidelines issued therein posed a threat of lack of judicial adaptation of the new developments and ignored the reliability on a particular piece of evidence.

44. *Ranjitsing Brahmajeetsing Sharma v State of Maharashtra*, AIR 2005 SC 2277 : 2005 AIR SCW 2215 : 2005 Cr LJ 2533.

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